3.6 ELECTROMAGNETIC FIELDS AND ELECTROMAGNETIC INTERFERENCE

This section describes the potential impacts of electromagnetic fields (EMFs) associated with operation of the No Project, Modal, and High-Speed Train (HST) Alternatives. The principal topics discussed in this section are potential impacts on personal health and potential impacts on electronic and electrical devices as a result of electromagnetic interference (EMI).

3.6.1 Regulatory Requirements and Methods of Evaluation

A. REGULATORY REQUIREMENTS

Neither the federal government nor the State of California has established regulatory limits for EMF exposure. The Federal Communications Commission (FCC) regulates sources of radiofrequency (RF) fields to maintain the quality of wireless communications across the spectrum. The FCC, which does not regulate for health and safety, has adopted regulations applicable to EMF exposure that were derived from health and safety evaluations made by the American National Standards Institute/Institute of Electrical and Electronic Engineers (ANSI/IEEE) and the National Council on Radiation Protection (NCRP). FCC regulations would apply to intentional radiators such as the proposed HST wireless systems for both operational and amenity purposes. FCC regulations would otherwise apply only if HST operations (RF interference) interfered with legitimate spectral uses.

Voluntary standards for EMF exposure have been developed by the International Committee on Electromagnetic Safety (ICES), which is sponsored by IEEE. The federal and state governments do not enforce these voluntary standards. The standards are based on studies of electrostimulation (i.e., nerve and muscle responses to the internal electric field in the body). ICES standards recommend maximum permissible 60-Hz magnetic field exposure levels that are a few thousand times higher than 0.3 to 0.4 microtesla (µT) (3 to 4 milligauss [mG]). Magnetic fields greater than 0.3 to 0.4 µT are relatively uncommon exposures that are found in a small percentage of homes that have been shown to have a possible association with childhood leukemia based on inconclusive evidence (National Institute of Environmental Health Sciences 1998, 1999; International Agency for Research on Cancer 2002). Unresolved scientific issues concerning health effects of power frequency extremely low frequency (ELF) magnetic fields were examined extensively by the California Department of Health Services (Neutra et al. 2002) in response to a request from the California Public Utilities Commission. There is no evidence to substantiate a relationship between ELF electric fields and cancer (International Agency for Research on Cancer 2002), and the low-level electric fields typically found in homes have not been associated with other diseases (National Institute of Environmental Health Sciences 1998; Institute of Electrical and Electronic Engineers 2002). The ANSI/IEEE standards; NCRP recommendations, International Commission on Non-Ionizing Radiation protection (ICNIRP) guidelines, American Conference of Governmental Industrial Hygienists, Inc. (ACGIH) guidelines suggest maximum permissible 60-hertz (Hz) electric field levels for public exposure at 4.2 to 10 kilovolts (kV) per meter.

B. METHOD OF EVALUATION OF IMPACTS

The Modal and HST Alternatives were analyzed for EMF/EMI by a search of existing literature and expert opinion (volunteer scientists and engineers from academia and industry working in accordance with IEEE rules) based on that literature. Issues concerning EMF[1] biological and health effects at all frequencies of concern for the HST alternative are the subject of the scientific discipline known as bioelectromagnetics, which is served by The Bioelectromagnetics Society, other scientific organizations, and an extensive scientific literature that has been critically reviewed by scientific expert committees convened by a number of national and international bodies. This body of

[1] EMF covers ELF and RF forms of electric and magnetic fields, and electromagnetic fields.

information is used in this Program EIR/EIS to describe the potential effects for each of the system alternatives. The medical and scientific communities have been unable to determine whether usual residential exposures to EMFs cause health effects or to establish any standard or level of exposure that is known to be either safe or harmful.

3.6.2 Affected Environment

A. STUDY AREA DEFINED

The study area for EMF/EMI associated with operation of the alternatives is limited to potentially affected land uses and populations in the vicinity of the alternative corridors.

B. GENERAL DISCUSSION OF ELECTROMAGNETIC FIELDS

EMFs occur both naturally and as a result of human activity. Naturally occurring EMFs include those caused by weather and the earth's magnetic field. EMFs also are generated by technological application of the electromagnetic spectrum for uses such as the generation, transmission, and local distribution of electricity; electric appliances; communication systems; marine and aeronautical navigation; ranging and detection equipment; industrial processes; and scientific research.

EMFs are described in terms of their frequency, or the number of times the electromagnetic field changes direction in space each second. Natural and human-generated EMFs encompass a broad frequency spectrum. In the United States, the electric power system operates at 60 Hz, or cycles per second, meaning that the field reverses its direction 60 times per second. In Europe, some parts of Japan, and many other regions, the frequency of electric power is 50 Hz. Radio and other communications operate at much higher frequencies; many are in the range of 500,000 Hz (500 kilohertz) to 3 billion Hz (3 gigahertz). In areas not immediately adjacent to transmission lines, 60-Hz EMFs exist because of electric power systems and uses such as building wiring and electrical equipment or appliances.

The strength of magnetic fields often is measured in µT or mG. As a baseline for comparison, the geomagnetic field ranges from 50 to 70 µT (500 to 700 mG) at the surface of the earth. Research on ambient magnetic fields in homes and buildings in several western states has found average magnetic field levels within rooms to be approximately 0.1 µT (1 mG), while measured values range from 0.9 to 2.0 µT (9 to 20 mG) in the immediate area of appliances (Severson et al. 1988, Silva et al. 1988).

Depending on the configuration of the source, the strength of an EMF decreases in proportion to distance or distance squared, or even more rapidly. Because the rate of decrease and the distance at which impacts become insignificant depend on technical specifications such as the source's geometric shape, size, height above the ground, and operating frequency, it is not possible to define a characteristic distance for the extent of field effects that applies in general for all sources. Because of their rapid decrease in strength with distance, EMFs in excess of background levels are likely to be experienced only comparatively near sources. Consequently, only persons on or in close proximity to the proposed HST system would be likely to experience such increases, and while HST operations could introduce some very low but measurable changes in 60-Hz magnetic fields up to 1,000 feet or more from the right-of-way, these low-level changes are not known to be hazardous. ELF is variously defined as having a lower limit of greater than zero (3 or 30 Hz) and an upper limit of 30, 100, 300, or 3000 Hz. The HST catenary and distribution systems will primarily have 60-Hz fields.

In addition to the 60-Hz EMFs generated by the power supply system, the HST Alternative would generate incidental RF fields, and would also use RF fields for wireless communications. The 60-Hz electric and magnetic fields from power-supply systems would occur everywhere near the energized conductors, but only the magnetic fields would vary in strength depending on load. Load would depend on the number of trains in the segment and their operating conditions (acceleration, speed, weight of vehicles, passengers and freight, grade). Hence, in time, the magnetic fields (MFs) are variable, whereas the electric fields (EFs) are constant. Similarly, EFs along the route would be similar for a given distribution and transmission voltage, whereas MFs along the route would depend on nearby loads. Therefore, daily MF averages would differ for different locales because of different local HST traffic. The information presented in this document primarily concerns EMFs at power frequencies of 50 or 60 Hz, and RFs produced intentionally by HST communications or unintentionally by electric discharges (arcing) between the catenary wire and the train's power pickup and other sources of corona discharge typical of high-voltage systems. EMI occurs when the EMFs produced by a source adversely affect operation of an electrical, magnetic, or electromagnetic device. EMI may be caused by a source that intentionally radiates EMFs (e.g., a broadcast station) or one that does so incidentally (e.g., an electric motor).

C. POTENTIALLY AFFECTED LAND USES AND POPULATIONS

Public and occupational exposure to EMFs is widespread and encompasses a broad range of field intensities and durations. Land uses of interest for potential impacts from exposure to EMFs are residences, schools, and daycare centers along the corridors for each of the alternatives. Specialized uses of interest for evaluation for possible sensitivity to EMI are wireless communication, health care, scientific, and military facilities. These facilities may be used for purposes that include public safety, commerce, radio and television broadcasting, scientific research, commercial fabrication, and military testing and operations. The levels of EMF generation are unlikely to impair radio and radar communications at an airport because of the distance between the control tower and the proposed alignments. Transportation alignments may abut property used for educational, medical, religious, and athletic activities. In rural settings, land is largely undeveloped or in agricultural use but can have any of the other uses noted for urban and suburban areas. In addition, transportation passengers and workers would be exposed to EMFs in or below the range of EMFs generated by other rapid transit and electric railroad systems.

3.6.3 Environmental Consequences

A. EXISTING CONDITIONS COMPARED TO NO PROJECT ALTERNATIVE

Under the No Project Alternative, EMFs along existing roadways and railroad rights-of-way would be affected by technological developments in the period before 2020 and by technology- and population-driven changes in total energy consumption. General EMF levels may increase because of massive implementation of low-level RF and infrared for radar and radar-like purposes, as well as possible wireless data transfer for vehicle control by advanced automotive technologies such as collision-avoidance systems and automatic vehicle guidance systems implemented on freeways and highways. Expansion of conventional rail and transit systems using electric propulsion would also increase levels of ELF magnetic fields near new electrical infrastructure. However, any changes in transmission line loads would not directly change residential magnetic fields significantly (Swanson 1996). In addition, the large-scale use of electrically powered automobiles could increase general EMF exposure. The No Project Alternative is not likely to cause significant changes in EMF levels, or human exposure to EMFs or EMI.

B. NO PROJECT COMPARED TO MODAL AND HIGH-SPEED TRAIN ALTERNATIVES

<u>Modal Alternative</u>

Under the Modal Alternative, improvements to airports may increase EMFs because of increased use of radar, radio communications, and instrument landing systems. ELF magnetic fields produced by the electric power system would increase because of additional power used by new or enlarged terminal facilities. However, an expanded airport operation would be local to the facility (control tower) and lines immediately serving it, not a general effect on surrounding neighborhoods or communities (noting that general residential magnetic field exposures are not directly related to transmission line loads) (Swanson 1996). Therefore, the Modal Alternative is not likely to cause significant changes in EMF levels, or human exposure to EMFs or EMI.

High-Speed Train Alternative

Under the HST Alternative, an electrified train system would require delivery of a variable amount of electric power (a maximum per trainset on the order of 10 megawatts) at ± 25 kV of 60 Hz power by an overhead catenary system (OCS) extending the length of the right-of-way. The OCS would be powered from multiple supply substations located near the right-of-way and connected via high-voltage transmission lines to the statewide electric power grid. Two-phase power at ±25 kV would be carried on overhead transmission lines or in cables from supply substations to the OCS. In addition, substations at intermediate locations would serve switching and power boosting functions, although they would not be connected to the power grid. Control, monitoring, safety, and communications systems for railroad operations would use a fiber-optic cable system. Wireless communications would connect trainsets to the fiber-optic cable system. In addition, there would be a standard railroad block control system that would use a small current in the rails to sense train location.

Various components of the HST infrastructure and the trains themselves would be sources of both ELF and RF EMFs. Many of the ELF sources resemble the power lines, substations, and transmission lines used for the statewide electric power system, with the distinction that wayside power uses two electrical phases rather than the three phases that the California and national power systems use. Three-phase 60-Hz power would be supplied from high-voltage transmission lines connected to the power grid for conversion at substations to two-phase ±25-kV, 60-Hz power supplied to the OCS and trains. RF EMF, a principal source of EMI, is produced at the right-of-way by intermittent contact (unintentional arcing) between the pantograph power pickup and catenary wire. RF of this type is characterized by a band of frequencies ranging from kilohertz to megahertz. For transfer of data and voice communications from the fiber-optic trunk to trains in motion, narrow-band RF EMF would be radiated at low power from a lossy coaxial cable or similar antenna design located within the right-of-way. These RF EMFs would resemble, in frequency and field strength, the signals from short-range radio technologies such as walkie-talkies and cellular telephone handsets.

Figure 3.6-1 illustrates overall average magnetic field levels in five frequency bands for 14 transportation systems. Magnetic fields at 50 Hz in a French Train à Grande Vitesse (TGV) vehicle were averaged for measurements made at the head, ankle, and waist of passengers riding in several different vehicles and at several times. The overall 50-Hz magnetic field average was less than 0.5 µT (5 mG). This was several times less than for passengers on a conventional electrified train or electric shuttle bus, but several times greater than for passengers on ferry boats, non-electrified trains, escalators, and people-mover walkways. Localized magnetic fields in an HST vehicle can significantly exceed the overall average. Railroad EMFs decrease with distance from the right-of-way, substation, or power line and have negligible regional or statewide impact.

The HST system would traverse diverse geography and land uses in California with a diversity of potential EMF exposure in urban, suburban, rural, agricultural, and industrial regions. The populations potentially exposed to EMFs from the HST system include passengers, train crew, and other HST workers, as well as people in residences immediately adjacent to the distribution lines or rail line and at adjacent commercial, industrial, educational, medical care, military, and recreational facilities. Present understanding of health effects from long-term exposure to ELF magnetic fields is incomplete but shows that risks to the health of children and adults are either low or nonexistent. Effects of EMI may occur depending on distance to HST facilities and operating conditions. The variable nature of HST power consumption, which changes with operational conditions that include the distance to a moving train, number of operational trains, and train acceleration and velocity, indicates that comparisons to less variable sources of ELF EMF fields may not be appropriate. There is little potential for strong ELF EMFs that can interfere with implanted biomedical devices (cardiac pacemakers, defibrillators, and infusion pumps) to be generated, with the possible exception of potential exposures of HST maintenance workers. For current data and designs, it is not likely that the MF inside an HST vehicle could interfere with even the most susceptible pacemaker. Overall, it can be expected that the HST Alternative would introduce additional EMF exposures or EMI at levels for which there are no established adverse impacts.

3.6.4 Design Practices

Standard design practices for overhead catenary power supply systems and vehicles include the use of appropriate materials, spacing, and shielding to avoid potential EMF/EMI impacts.

3.6.5 Mitigation Strategies and CEQA Significance Conclusions

ELF magnetic fields can best be mitigated by design features that reduce fields at the source, but shielding of large sources (bigger than a transformer in a building, or 4 to 8 cubic m) in affected environments would not be not practical. Careful design of the OCS, substations, and transmission lines could reduce ELF magnetic fields to a practical minimum.

Mitigation of ELF electric fields is sometimes possible by changes in the design of the source, and some shielding of a large source can be achieved by increasing vegetation. Relatively effective shielding of 60-Hz electric fields is afforded by ordinary building materials, and very good shielding is afforded by metal panels or screens.

EMI can be reduced at the project level through designs that minimize arcing and radiation of RF energy. Additional mitigation by shielding of sources is not practical, but susceptibility to EMI can be reduced by choosing RF devices designed for a high degree of electromagnetic compatibility. In some cases, electronic filters can be added to attenuate RF EMI. Relocation of receiving antennas and changes in antenna design to models with greater directional gain could mitigate EMI impacts, particularly for sensitive receptors near the HST system.

Based on the analysis above, and considering the CEQA Appendix G thresholds of significance for effects on human beings, it is expected that potential adverse effects from electromagnetic fields due to the proposed HST alternative could be avoided or mitigated to a less-than-significant level. Many of the design practices and mitigation strategies will be dependent on the project-level analysis and refinement of mitigation measures to address site-specific impacts. Specific structures and receptors evaluated at the project-level will influence the design of power supply systems and vehicles to shield and avoid EMF/EMI impacts, and mitigation measures refined from the mitigation strategies in this program EIR/S are expected to avoid or substantially lessen the impacts. Additional environmental assessment will allow more precise evaluation in the second-tier, project-level environmental analysis.

3.6.6 Subsequent Analysis

The following issues would be evaluated as part of the project-level analysis of an HST system.

- Proximity of occupied structures to high-voltage transmission lines serving supply stations.
- EMFs at passenger stations.
- EMFs in the vehicle compartment. This would require train design to take EMFs into account (e.g., seeking to limit them in the vehicle compartment to the extent practicable and feasible).

- EMFs at specific locations used by the train crew.
- Earth-return currents or power flows in circuits along the rails, where some fraction of the current finds its way back to substation or generating station through the earth for various regions and soil conditions, and the effects of different design and construction practices on these currents. The substations and generating stations would themselves be soundly connected to ground, allowing the earth currents to return there.
- Identification of specific structures (e.g., pipelines, cables, fences) that are particularly susceptible to induced ELF currents and methods for mitigation.
- Identification of receptors (e.g., telecommunications and research facilities) at specific locations with possibly greater sensitivity to EMI impacts.
- Spectral composition of RF generated by the pantograph-catenary contact under operational conditions.
- Technical features (e.g., frequency, field strengths, and modulation system) of the right-of-way-to-train wireless communications system.
- Consider development of an electromagnetic compatibility control plan (as described in APTA SS-E-010-98) to characterize EMI sources, reduction techniques, and susceptibility control procedures (shielding, surge protection, fail-safe circuit redesign, changed location of antennas or susceptible equipment, redesign of equipment, enclosures for equipment); include a safety analysis and failure analysis; and address grounding or shorting hazards.

3.7 LAND USE AND PLANNING, COMMUNITIES AND NEIGHBORHOODS, PROPERTY, AND ENVIRONMENTAL JUSTICE

This section evaluates the potential impacts of the No Project, Modal, and High-Speed Train (HST) Alternatives on land use compatibility, communities and neighborhoods, and property. This section also addresses environmental justice in accordance with the provisions of Executive Order (EO) 12898. This evaluation describes how existing conditions compare with the No Project Alternative and how the No Project Alternative compares with the potential impacts of the HST and Modal Alternatives, including a comparison among the HST alignment and station options within segments of the proposed HST system, in the five regions being studied.

3.7.1 Regulatory Requirements and Methods of Evaluation

A. REGULATORY PROVISIONS

Land Use, Communities and Neighborhoods, and Property

This section addresses the potential effects of each of the alternatives on existing and planned land uses. This section includes a discussion of the existing uses in and adjacent to areas where property acquisition may be needed for an alternative, an analysis of the changes to these uses which may occur with an alternative, a discussion of potential inconsistencies with land use plans, and identification of general mitigation strategies. The discussion of potential inconsistencies with planned land uses does not imply that the California High Speed Rail Authority (Authority), a state agency, would be subject to such plans or local ordinances, either directly or through the NEPA or CEQA process. The information is provided in order to indicate potential land use changes that could result in potential environmental impacts.

Environmental Justice

EO 12898, known as the federal environmental justice policy, requires federal agencies to address to the greatest extent practicable and permitted by law the disproportionately high adverse human health and environmental effects of their programs, policies, and activities, on minority populations and low-income populations in the United States. Federal agency responsibilities under this EO also apply to Native American programs. Department of Transportation (DOT) Order 5610.2 on environmental justice defines “disproportionately high and adverse effect on minority and low-income populations” to mean an adverse effect that is predominately borne by a minority population and/or a low-income population, or will be suffered by the minority population and/or low-income population and is appreciably more severe or greater in magnitude than the adverse effect that will be suffered by the non-minority population and/or non-low-income population (Department of Transportation Order 5610.2, Appendix Definitions, subd.[g]).

The California Government Code defines environmental justice as the “fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies” (California Government Code § 65040.12[e]). There are no specific state procedures prescribed for consideration of environmental justice issues related to the proposed HST system.

B. METHODS OF EVALUATION OF IMPACTS

The analysis was conducted using existing U.S. Census 2000 tract information/data compiled in a geographic information systems (GIS) format, local community general plans or regional plans, and land use information provided by the planning agencies in each of the regions. Existing and future conditions were described for the No Project Alternative by documenting existing information for existing and planned future land use policy in potential alignment, potential station and existing airport areas, development patterns for employment and population growth, demographics, communities and neighborhoods, housing, and economics. The No Project Alternative was compared to the planned uses reflected in general plans and regional plans to see if it may result in potential effects on future development. The general and regional plans consulted for this section are listed in Chapter 12, *Sources Used in Document Preparation*.

The ranking systems described below were used to evaluate potential impacts for all three alternatives for land use changes, land use compatibility, and property. Potential impacts on communities and neighborhoods were also considered. The presence of minority populations and low-income populations in the study area for the alternatives was identified in order to consider potential environmental justice issues. Because this is a programmatic environmental review, the analysis of these potential impacts was performed on a broad scale to permit a comparison of relative differences among the alternatives. Further evaluation of potential impacts would occur at the project-level environmental review, should a decision be made to proceed with the proposed HST system.

Land Use Compatibility

The potential compatibility of the alternatives with existing land use is evaluated based on the potential sensitivity of various land uses to the changes which would be included with the Modal and HST Alternatives, and the potential impact of these changes on existing and planned land uses. For example, homes and schools are more sensitive to changes that may result in increased noise and vibration (see Section 3.4, *Noise and Vibration)* or increased levels of traffic congestion (see Section 3.1, *Traffic and Circulation).* Industrial uses, however, are typically less sensitive to these types of changes because they interfere less with normal industrial activities. Since in this analysis an area's sensitivity or compatibility is based on the presence of residential properties, low, medium, and high levels of potential compatibility are identified based on the percentage of residential area affected, the proximity of the residential area to facilities included in the Modal or HST Alternatives, and the presence of local or regional uses (such as parks, schools, and employment centers.). For highway corridors (under the No Project and Modal Alternatives) and for proposed HST alignments, land use compatibility was assessed using GIS layers (or aerial photographs where available) to identify proximity to housing and population, and to determine whether the alignments would be within or outside an existing right-of-way in the study area. Potential impacts are considered low if existing land uses within a potential alignment, station, airport expansion area, or maintenance facility area are found to be compatible with the land use changes that may result from either the Modal or HST Alternative. The type of improvement that would be associated with either the Modal or HST Alternative would also affect the level of potential impact. Improvements such as potential widening of an existing right-of-way or the need for new right-of-way were considered to have a low compatibility with agricultural land. Conversely, if the improvement would be contained within the existing right-of-way or within a tunnel, the alternative was considered to be compatible with agricultural land.

Future land use compatibility is based on information from general plans and other regional and local transportation planning documents. These documents were examined to assess an alternative's potential consistency with the goals and objectives defined therein. The Modal Alternative is considered compatible if the highway or airport improvement is in the regional transportation plan (RTP) or regional airport master plan. The HST Alternative is considered highly compatible if it would be located in areas planned for transportation multi-modal centers or corridor development, redevelopment, economic revitalization, transit-oriented development, or high-intensity employment. Compatibility would be considered low if an alternative would be potentially inconsistent with local or regional planning documents. Table 3.7-1 summarizes the potential compatibility rating of existing and planned land use types with the alternatives, including potential HST alignment and station options. Thus, where potential compatibility would be rated low, the potential for impacts would be higher, and where potential compatibility would be rated high, the potential for impacts would be lower.

Table 3.7-1
Compatibility of Land Use Types

Low Compatibility	Medium Compatibility	High Compatibility
Single-family residential, neighborhood park, habitat conservation area, elementary/middle school, agricultural (widened or new right-of-way needed)	Multifamily residential, high schools, community parks, low-intensity industrial, hospitals	Business park/regional commercial, multifamily residential, existing or planned transit center, high intensity industrial park, service commercial, commercial recreation, college, transportation/utilities, high-intensity government facilities, airport or train station, agricultural (tunnel or no new right-of-way needed)

Communities and Neighborhoods

A potential impact on a community or neighborhood was identified if an alternative would create a new physical barrier, isolating one part of an established community from another and potentially resulting in a physical disruption to community cohesion. Improvements to existing transportation corridors, including grade separations, would not generally result in new barriers.

Property

Assessment of potential property impacts is based on the types of land uses adjacent to the particular proposed alignment, the amount of right-of-way potentially needed due to the construction type, and the land use sensitivity to potential impacts. Impacts include potential acquisition, displacement and relocation of existing uses, or demolition of properties.

In some instances, relatively minor strips of property would be needed for temporary construction easements or permanent right-of-way for the proposed HST alignments or highway expansions. In other instances, implementation of proposed facilities may result in acquisition, displacement, and/or relocation of existing structures. The types of property impacts that may occur include displacement of a residence or business or division of a farm or other land use in a way that makes it harder to use. Mitigation may also be required to maintain property access. Potential property impacts were ranked high, medium, or low as summarized below in Table 3.7-2.

Table 3.7-2
Rankings of Potential Property Impacts

Facility Requirements	Type of Development: Residential: Rural/ Suburban	Residential: Suburban/ Urban	Residential: Urban	Non-residential: Rural Developed	Non-residential: Suburban Industrial/ Commercial	Non-residential: Urban Business Parks/ Regional Commercial	Rural Non-developed
No additional right-of-way needed (also applies to tunnel segments for HST Alternative)	Low	Low	Low	Low	Low	Low	Low
Widening of existing right-of-way required	Medium	Medium	High	Low	Medium	High	Low
New corridor (new right-of-way required; includes aerial and at-grade arrangements)	High	High	High	Medium	Medium	High	Low to medium

To determine potential property impacts, the land uses within 50 feet (ft) (15 meters [m]) of either side of the existing corridor, or within 50 ft (15 m) of both sides of the centerline for new HST alignments, were characterized by type and density of development. Densities of structures, buildings, and other elements of the built environment are generally higher in urbanized areas. *Rural/suburban* residential refers to low-density, single-family homes. *Suburban/urban* is medium density, multifamily housing such as townhouses, duplexes, and mobile homes. *Urban residential* refers to high-density multifamily housing such as apartment buildings. *Rural developed* non-residential uses typically occur in non-urbanized areas and often include developed agricultural land such as vineyards and orchards. *Suburban industrial/commercial* refers to medium density non-residential uses and includes some industrial uses, as well as transportation, utilities, and communication facilities. *Urban business parks/regional commercial* refers to non-residential uses that occur in urbanized areas and includes such uses as business parks, regional commercial facilities, and other mixed use/built-up uses. *Non-rural undeveloped land* includes cropland, pasture, rangeland, and few structures. The classification of development types was based on land use information provided by the planning agencies in each of the regions.

Environmental Justice

This analysis is based on identifying the presence of minority populations and low-income populations in the study area (0.25 mi [0.40 km] from a potential alignment), and generally in the counties crossed by the alignments included in the alternatives. This assessment was done using U.S. Census 2000 information and alignment information to determine if minority or low-income populations exist within the study areas and if they do, whether the alignments would be within or adjacent to an existing transportation right-of-way (lower potential for impacts) or new alignments (higher potential for impacts).

Based on the above information, the analysis determined the following.

- Whether at least 50% of the population in the study area may be minority or low-income.
- Whether the percentage of minority or low-income population in the study area may be at least 10% greater than the average generally in the county or community.

The assessment of potential for impacts on minority and low-income populations considered the size and type of right-of-way needed for the alternatives. For example, if an alignment were within an existing right-of-way, the potential for impacts would be lower. If the alignment would be on new right-of-way, then the potential for impacts may be higher. The potential alignments, however, have been identified and described to largely use or be adjacent to existing transportation rights-of-way in order to avoid or reduce potential impacts on natural resources and existing communities to the extent feasible and practicable (see Chapter 2, *Alternatives*). Since this is a program-level document, the analysis considers the alternatives on a broad scale, including the proposed HST system as a whole. It is not expected that the proposed HST system as a whole would result in disproportionate impacts on minority or low-income populations. Additional analysis would take place during project-level analysis to consider potential localized impacts.

3.7.2 Affected Environment

A. STUDY AREA DEFINED

The study area for land use compatibility, communities and neighborhoods, and environmental justice, is 0.25 mi (0.40 km) on either side of the centerline of the rail and highway corridors included in the alternatives, and the same distance around stations, airports, and other potential HST-related facilities. This is the extent of area where either the Modal or HST Alternative might result in changes to land use; the type, density, and patterns of development; and socioeconomic conditions. For the property impacts analysis the study area is narrower—100 ft (30 m) on either side of the alignment centerlines—to better represent the properties most likely to be impacted by the improvements included in the alternatives (e.g., potential highway widenings or potential HST lines).

The planned land use for all regions is generally described by city and county general plans that encompass the alignments for the HST and Modal Alternatives. Several regulatory agencies and special districts also have future development plans that are considered in this analysis for lands these alternatives would cross. Communities have typically recognized and incorporated the existing rail and highway corridors in their general land use plans, and most communities encourage transit-oriented development and transit facilities to relieve highway congestion and improve mobility.

Other resources such as U.S. Census 2000 data, California Department of Finance data, aerial photos, and field observations were used to document existing and future (Year 2020) conditions for demographics, communities, and neighborhoods.

Figures 3.7-1 through 3.7-4 show the general land uses existing in each region.

B. DISCUSSION OF RESOURCES BY REGION

This section briefly describes the five regions the project would potentially traverse and briefly discusses the land use-related resources in the regions under the following five categories: existing and planned land use, population characteristics, income, neighborhood and community characteristics, and housing.

For this discussion, land use data came from local governments and regional agencies such as metropolitan planning organizations. The source of demographic information (existing population and projects, ethnicity, income, and housing) was primarily the California Department of Finance and U.S. Census 2000. This data, as well as existing and planned land use information, were compiled in a GIS format.

Bay Area to Merced

This region includes the San Francisco Bay Area (San Francisco and Oakland) south to the Santa Clara Valley and east across the Diablo Range to the Central Valley.

Existing Land Use: For most of the northern part of the region, the highway (US-101, I-80, I-880, and SR-152) and rail corridors that the Modal and HST Alternatives would use are existing transportation corridors surrounded by the built-up urban areas that they serve. Adjacent land uses are a mix of residential, industrial, commercial, and other urban uses. Industrial uses are concentrated around San Francisco International Airport (SFO) off US-101, Norman Y. Mineta San Jose International Airport (SJC), and Oakland International Airport (OAK). SFO and OAK are adjacent to San Francisco Bay. Commercial and residential uses are located to the southwest of SJC. The Don Edwards San Francisco Bay National Wildlife Refuge lies on the east side of the Bay, as discussed in Section 3.15, *Biological Resources and Wetlands*. The southern part of the US-101 corridor in this region includes some agricultural uses and rangeland. The segment of SR-152 between US-101 and I-5 passes through the Diablo Mountain Range and continues through Pacheco State Park, Cottonwood Creek Wildlife Area, and other open space, wildlife, and recreational areas. Agriculture and rangeland uses are prevalent east of I-5. Proposed HST alignment options would pass through the Diablo Mountain Range north of or through Henry Coe State Park and north of the Andersen Reservoir. HST options that are proposed farther south would pass through or by Gilroy through primarily agricultural lands.

Population Characteristics: The Bay Area to Merced region includes 13 counties: Madera, Merced, San Benito, Stanislaus, Santa Clara, Alameda, San Mateo, San Francisco, Contra Costa, Solano, Yolo, Sacramento, and San Joaquin. Population in this region grew from 7.6 million people in 1990 to 8.7 million in 2000, an increase of 14%. By 2020, population in the region is expected to reach 10.8 million, an increase of 23% over 2000 levels. According to U.S. Census 2000, minority persons, defined as non-white persons including persons of Hispanic origin, accounted for the following percentages of total population in the counties in the region (lowest to highest): Yolo 42%, Sacramento 42%, Contra Costa 42%, Stanislaus 43%, San Mateo 50%, Solano 51%, San Joaquin 53%, Santa Clara 53%, Madera 53%, San Benito 54%, San Francisco 58%, Alameda 59%, and Merced 60%.

Income: According to U.S. Census 2000, the average federal poverty threshold for a family of four with two children under the age of 18 is an annual income of $17,603. The percentages per county of households identified as below federal poverty level in this region are (lowest to highest) San Mateo 6%, Santa Clara 8%, Contra Costa 8%, Solano 8%, San Benito 10%, Alameda 11%, San Francisco 11%, Sacramento 14%, Stanislaus 16%, Yolo 18%, San Joaquin 18%, Madera 21%, and Merced 22%.

Neighborhood and Community Characteristics: The portion of the region along the San Francisco Bay and southward into Santa Clara County is generally highly urbanized, and is characterized by a mix of residential communities, commercial, industrial, and public/institutional land uses. As the region continues south and east into the Central Valley, it includes undeveloped and agricultural areas, interspersed with suburban communities.

Sacramento to Bakersfield

This region of central California includes a large portion of the Central Valley (San Joaquin Valley) from Sacramento south to Bakersfield.

Existing Land Use: The existing land uses along the potential routes of the Modal and HST Alternatives in this region are predominantly agricultural, reflecting the Central Valley's heritage as one of the richest, most productive agricultural regions in the world (as discussed in Section 3.8, *Agricultural Lands)*. Much of the land in the vicinity of the highway and rail corridors in the region proposed for improvements is cropland and orchards. Residential development comprises less than 10% of the land area, and commercial, service, and industrial uses together account for less than 10%. Development is focused in and around existing cities and towns where residential, commercial, and industrial uses are concentrated. Beyond city limits, land uses are predominantly agricultural, with scattered rural residences, small towns, and warehouse-style industrial development along the rail and highway corridors included in the Modal and HST Alternatives. Between Sacramento and Stockton, the easterly Central California Traction Company (CCT) alignment traverses more rural lands than the Union Pacific Railroad (UPRR). While much of the area between Stockton and Modesto is agricultural in nature, there are large residential tracts and smaller commercial areas along UPRR and, to a lesser extent, along the Burlington Northern Santa Fe (BNSF) alignment. South of Modesto to Merced, land uses are predominantly agricultural along the HST route that would follow BNSF. Near Merced Airport, a variety of government uses, many ranchettes, and rural residential or agricultural uses are located.

South of the City of Merced, the land uses mirror the predominant land use in this area of the valley: fragmented agricultural lands scattered with residences and a few small towns. As the UPRR rail alignment approaches the Fresno urban core, residential uses dominate the landscape to the east, and a mix of light industrial, heavy commercial, and open space line the stretch on the western side. Beyond industrial uses on the south side of Fresno, development becomes sparser, giving way to scattered rural residences and agricultural uses. Continuing into Tulare County, the various routes proposed for the Modal and HST Alternatives would pass farmlands and the Colonel Allensworth State Historic Park. South of this park all the way into Bakersfield, agriculture is the predominant land use, the only exception being small towns. Approaching Bakersfield, the rail alignments continue into the dense urban environment. At Bakersfield Airport, light industrial and heavy commercial uses line SR-99, with agricultural uses to the west.

Population Characteristics: The Sacramento to Bakersfield region includes nine counties: Sacramento, San Joaquin, Stanislaus, Merced, Madera, Fresno, Tulare, Kings, and Kern. In 2000, there were 4.6 million people living in this region. By 2020, the population is expected to increase by 46% to 6.7 million.

Throughout most of the region, the percentage of whites and Hispanics in the overall population by county is comparable (Fresno: whites 40%, Hispanics 44%; Kings: whites 42%, Hispanics 44%; Madera: whites 47%, Hispanics 44%; Merced: whites 41%, Hispanics 45%; and Tulare: whites 42%, Hispanics 51%). Counties that have non-agricultural industries or are within commuting range of the San Francisco Bay Area tend to have larger percentages of whites (e.g., Sacramento: whites 58%, Hispanics 16%; San Joaquin: whites 47%, Hispanics 31%; Stanislaus: whites 57%, Hispanics 32%; and Kern: whites 49%, Hispanics 38%).

Income: Per-capita income tends to be lower in communities that rely chiefly on an agricultural employment base. For example, Kings County, with a population of 129,500 in 2000, had a workforce of 45,880 people, 14% of which were unemployed, and an average per-capita income of $15,492. Counties that have a more diversified economy (including industries such as oil, healthcare, and technology), such as Kern and Sacramento Counties, tend to support larger workforces at higher average incomes. Sacramento County, with a population of 1.2 million in 2000, had a workforce of 605,500 people, only 4% of which were unemployed, and an average per-capita income of $26,257.

The percentage per county of households identified as below federal poverty level (less than $17,603 annually) in the Sacramento to Bakersfield region is (lowest to highest) Sacramento 14%, San Joaquin 18%, Stanislaus 16%, Kings 20%, Kern 21%, Merced 22%, Madera 21%, Fresno 23%, Tulare 24%.

Neighborhood and Community Characteristics: There are a number of established neighborhoods within the cities along the highways and roadways included as potentially feasible for modification under the Modal Alternative, and along the rail corridors proposed for HST Alternative alignments. There are also a number of older agricultural communities in the unincorporated portions of the counties.

Bakersfield to Los Angeles

This region of southern California encompasses the southern portion of the Central Valley south of Bakersfield, the mountainous areas between the Central Valley and the Los Angeles basin, and the northern portion of the Los Angeles basin from Sylmar to downtown Los Angeles.

Existing Land Use: Along SR-99 and I-5, the corridors relevant to the Modal and HST Alternatives, this region consists of three distinct sub-regions: north, central, and south. The northern portion of the region—from Bakersfield south to the northern base of the mountains—is largely agricultural until it enters the suburban mix of land uses in southern Bakersfield. The central portion of the region crosses the mountains and is characterized by rugged and largely undeveloped land. Much of this area is in national forest, and some is rangeland. A portion of the central segment passes through the high desert suburban communities of Palmdale and Lancaster. In the Santa Clarita area, some areas abutting proposed Modal and HST Alternative alignments are designated significant ecological areas (as described in Section 3.15, *Biological Resources and Wetlands).* The southern portion, extending from Sylmar to Los Angeles Union Station (LAUS), is an older, highly urbanized area characterized by a mix of residential, commercial, industrial, and public/institutional land uses. Burbank-Glendale-Pasadena Airport is located within this urban context.

Population Characteristics: The Bakersfield to Los Angeles region includes two counties: Kern and Los Angeles. Total population in the region increased from 9.4 million in 1990 to 10.2 million in 2000, an average annual growth of 0.8%. Population in Kern County increased by 118,000 people over that period, but the majority of the growth occurred in Los Angeles County, where population increased by 656,000 people between 1990 and 2000. Total population in the region is expected to increase to 12.7 million between 2000 and 2020, a 1% average annual growth rate. Los Angeles County is expected to contribute the majority (92%) to the forecast increase.

Minority persons, defined as non-white persons, accounted for 51% of Los Angeles County's population in 2000. Minorities accounted for 38% of the population in Kern County. The Hispanic population percentage in Los Angeles County is 45%; it is 38% in Kern County.

Income: Income in the region was $20,363 per capita in 1999, and 18% of the population had incomes below the federal poverty level ($17,603). In Kern County, per-capita income was $15,760, with 21% of the population below the federal poverty level. In Los Angeles County, per-capita income was $20,683, with 18% of the population below the federal poverty level.

Neighborhood and Community Characteristics: As noted above, the Bakersfield to Los Angeles study area consists of three distinct sub-regions: northern, central, and southern. The northern portion, extending from the northern toe of the mountains to Bakersfield, is largely agricultural until it enters the suburban mix of land uses in southern Bakersfield. The central portion crosses the mountains and is characterized by rugged and largely undeveloped land. Much of this area is in national forest. A portion of the central segment passes through the high desert suburban communities of Palmdale and Lancaster. The southern portion, extending from LAUS to Sylmar, is an older, highly urbanized area characterized by a mix of residential, commercial, industrial, and public/institutional land uses.

Los Angeles to San Diego via Inland Empire

This region of southern California includes the eastern portion of the Los Angeles basin from downtown Los Angeles east to the Riverside and San Bernardino areas and south to San Diego generally along the I-215 and I-15 corridors.

Existing Land Use: Existing land use in the LAUS to March Air Reserve Base (ARB) section of the study area in the region is largely developed. The major land use in this area is low-density residential. Combined residential uses comprise nearly 35% of the area adjacent to I-10, while industrial uses predominate along the railroad alignments under consideration for HST alignment options. Transportation and utility uses are present in or adjacent to both rail and freeway rights-of-way. Undeveloped land and commercial uses are also present. The majority of the surrounding land use is low-density residential in the proposed HST segment that would loop through San Bernardino. Industrial uses and undeveloped land comprise the next highest concentration.

Half of the segment between March ARB to Mira Mesa lies in Riverside County, and the other half is in the San Diego Association of Governments (SANDAG) planning area. Undeveloped land is the largest land use in the Riverside County portion of this segment, with agricultural use second. Within the southern section, undeveloped land also makes up the largest portion. Residential uses comprise the next highest land use, followed by agricultural uses. Transportation and utility uses define the land dedicated to the I-15 and I-215 corridors. The variety of land uses along the corridor between Mira Mesa and San Diego reflects the generally suburban nature of northern San Diego and the urban character of the city. Other than transportation-related uses, parks, undeveloped land, commercial, office, and military uses comprise the largest areas. Light industry and institutional uses are found along the proposed Miramar Road HST segment.

Population Characteristics: This region includes four counties: Los Angeles, San Bernardino, Riverside, and San Diego. The population of the region increased by 12% between 1990 and 2000, from 13.9 million people to 15.5 million. By 2020, population in this region is forecast to reach 20.4 million, a 31% increase.

Minority persons accounted for 51% of Los Angeles County in 2000, 35% of Riverside County, 41% of San Bernardino County, and 34% of San Diego County. Hispanic population accounted for 45% of Los Angeles County in 2000, 36% of Riverside County, 39% of San Bernardino County, and 27% of San Diego County.

Income: In Los Angeles County, per-capita income was $20,683, with 18% of the population below the federal poverty level ($17,603). In Riverside County, per-capita income was $18,689, with 14% of the population below the federal poverty level. San Bernardino County had a per-capita income of $16,865, with 16% of the population below the federal poverty level. San Diego County's per-capita income was $22,926, with 12% of the population below the federal poverty level.

Neighborhood and Community Characteristics: The Los Angeles to San Diego via Inland Empire region consists of the older, urbanized areas of central and eastern Los Angeles County, the more recently urbanized portions of western San Bernardino and Riverside counties, the urbanizing areas of central and southwest Riverside County, the urbanizing areas of northwestern San Diego County, and the urbanized portions of the city of San Diego.

Los Angeles to San Diego via Orange County

This region includes the western portion of the Los Angeles basin between downtown Los Angeles and LAX, and the coastal area of southern California between Los Angeles and San Diego, generally following the existing Los Angeles to San Diego via Orange County I-5 highway corridor.

Existing Land Use: This region is largely urbanized, with the exception of the Camp Pendleton military base between San Clemente and Oceanside. The major existing land uses in the study area in this region include single-family residential, commercial and industrial, transportation and utilities, and community parks.

Population Characteristics: This region includes three counties: Los Angeles, Orange, and San Diego. The region's population increased by 10% between 1990 and 2000, from 13.8 million persons to 15.2 million. By 2020, population in this region is forecast to reach 18.6 million, an increase of 23%.

Minority persons accounted for 51% of Los Angeles County in 2000, 35% of Orange County, and 34% of San Diego County. The Hispanic population is 45% in Los Angeles County, 31% in Orange County, and 27% in San Diego County.

Income: In Los Angeles County, per-capita income was $20,683, with 18% of the population below the federal poverty level ($17,603). Per-capita income in Orange County was $25,826, with 10% of the population below the federal poverty level. San Diego County had a per-capita income of $22,926, with 12% of the population below the federal poverty level.

Neighborhood and Community Characteristics: The proposed Modal and HST Alternative (HST and conventional rail) corridors would all pass through communities with similar characteristics. The corridors would cross the metropolitan area of Los Angeles, south Orange County, and the metropolitan area of San Diego. Communities in these areas have both common and unique characteristics shaped by a variety of political, physical, social, and economic factors. The Los Angeles metropolitan area can be characterized as a highly urbanized mix of single- and multifamily neighborhoods, with commercial and industrial development in such communities as Los Angeles, Norwalk, Fullerton, and Anaheim. The area is strongly influenced by the existing transportation network. The south Orange County area can be characterized as smaller communities with strong ties to the coastline. The communities comprise predominantly single-family neighborhoods with supporting commercial and industrial development. Communities such as San Juan Capistrano, Dana Point, and San Clemente represent this area. The San Diego metropolitan area can be characterized as a highly dense urban area rimmed by lower density suburban and coastal communities that have close interaction with coastal resources. Communities that represent this area are Oceanside, Carlsbad, Encinitas, Solana Beach, and Del Mar.

3.7.3 Environmental Consequences

A. EXISTING CONDITIONS COMPARED TO NO PROJECT ALTERNATIVE

Land use and local communities will change between 2003 and 2020 as a result of population growth and changes of economic activity in the five regions studied (see Chapter 5, *Economic Growth and Related Impacts).* The No Project Alternative is based on existing conditions and the funded and programmed transportation improvements that will be developed and in operation by 2020. Although it is expected that the No Project Alternative would result in some changes related to land use compatibility, communities and neighborhoods, property, and environmental justice, it was assumed that projects included in the No Project Alternative would include typical design and construction practices to avoid or minimize potential impacts, and would be subject to a project-level environmental review process to identify potentially significant impacts and to include feasible mitigation measures to avoid or substantially reduce potential impacts. Although some changes would be likely, attempting to estimate such changes would be speculative. Therefore, no additional potential impacts were quantified for the No Project Alternative.

B. NO PROJECT ALTERNATIVE COMPARED TO MODAL AND HIGH-SPEED TRAIN ALTERNATIVES

Land Use Compatibility

The Modal Alternative would be potentially incompatible with existing and planned land use in some segments to a greater extent than the No Project and HST Alternatives, because it would not be consistent with policies that support increased transit alternatives and reduced dependency on the automobile. The highway improvement options would support a dispersed pattern of development and would be inconsistent with local and regional planning objectives that promote transit-oriented higher-density development around transit nodes in order to encourage and increase planned in-fill for more efficient use of land and resources and sustainable growth.

The HST Alternative would include many potential new station locations, which were identified through consultation with local planning agencies and selected to be compatible to the extent possible with future planned land uses. Overall, the proposed HST Alternative would be highly compatible with local and regional plans that support rail systems and transit-oriented development. The HST Alternative would also provide improved inter-modal connectivity with existing local and commuter transit systems.

Communities and Neighborhoods

Similar to the No Project Alternative, the Modal Alternative would generally follow existing transportation corridors and rights-of-way, would not be expected to create new barriers within neighborhoods, and would not be expected to result in potential impacts on community cohesion. Though much of the HST Alternative would follow existing or planned transportation corridors, several alignment options would represent new transportation corridors. Along some of the potential alignments in all regions except the Los Angeles to San Diego via Orange County corridor, there would be potential for localized impacts on community cohesion, which would receive further study during project-level review, if a decision is made to proceed with the proposed HST system, and depending upon the alignments selected in the future.

Property

In the Bay Area to Merced and Los Angeles to San Diego via Orange County regions, potential right-of-way acquisition associated with transportation improvements under the No Project Alternative, such as the expansion of existing facilities and the construction of new facilities, could result in property impacts, which would be addressed in future project-specific environmental analyses prior to the implementation of these improvements. In the Sacramento to Bakersfield, Bakersfield to Los Angeles, and Los Angeles to San Diego via Inland Empire regions, the No Project Alternative is not anticipated to have substantial property impact potential. The No Project Alternative, which includes currently programmed and funded improvements and the mitigation for impacts that would be provided with these improvements as a result of environmental reviews, is the basis for analyzing the potential Modal and HST Alternatives.

Potential property impacts in addition to those under the No Project alternative would be expected to be substantially greater under the Modal Alternative than under the HST Alternative. In urban areas, highways are generally more constrained by denser development (which would have a higher potential for impacts, including residential uses) than railways. Therefore, highway expansion would have greater potential for impacts on land uses than rail expansion. Highways in urban areas also generally use most, if not all, of their existing right-of-way and would require additional right-of-way for expansion. Under the Modal Alternative, 309 mi (497 km) of highway alignment (20% of total Modal Alternative highway alignment in the region) would potentially affect high-impact land uses, and 289 mi (465 km) of alignment (19% of total Modal Alternative highway alignment) would affect medium-impact land uses.

Under the HST Alternative, between 53 mi (85 km) and 88 mi (142 km) of rail alignment and station locations (between 7% and 11% of total alignment distance) would potentially affect high-impact land uses, and between 92 mi (148 km) and 145 mi (233 km) of track alignment and station locations (between 11% and 17% of alignment distance) would potentially affect medium-impact land uses. Commercial and industrial uses are typically located along railways, and these uses buffer residential development from the railroad. Also, in several of the rail corridors under consideration, rail activity could be expanded within the existing right-of-way and would not require additional right-of-way.

Therefore, the HST Alternative would have less potential to affect high-impact land uses than the Modal Alternative. The Modal Alternative would potentially result in more than three times the mileage of high impacts on land uses than the HST Alternative. This potential for more property acquisition and residential and non-residential relocation, and the costs associated with these activities, represents a significant difference between the Modal and HST Alternatives.

Environmental Justice

Many of the alignments included in the Modal and HST Alternatives would be located in existing transportation corridors, which would serve to reduce potential for significant adverse environmental impacts generally. This broad-scale analysis considers the wide variety of landscape types and land uses, both low-density rural areas and developed communities, which would be adjacent to either the Modal Alternative (which would include nearly 3,000 additional highway lane miles [4,828 km] and certain airport expansions) or the HST Alternative (which includes more than 700 mi [1,127 km] of potential alignment and station options). Considering the alternatives on a system-wide basis, it is not expected that either the Modal or HST Alternatives would result in disproportionate impacts on minority populations or low-income populations. In addition, along with the potential environmental impacts analyzed in this Program EIR/EIS, general mitigation strategies are assessed which would be expected to be used to reduce potential impacts, if a decision were made in the future to proceed with the proposed HST system. If a decision were made to go forward with the proposed HST system, project-level review would include more detailed analysis of any potentially significant environmental impacts and mitigation measures to reduce such impacts. Project-level review would include additional consideration of potential localized impacts on neighborhoods and communities, in addition to potential community enhancements and benefits from the proposed HST system.

3.7.4 Comparison of Alternatives by Region

A. BAY AREA TO MERCED

Land Use Compatibility

Modal Alternative: All of the highway improvement options for US-101, I-880, SR-152, I-80, and I-580 would be constructed within or adjacent to existing transportation corridors. These improvements would be highly incompatible with existing land use in the US-101 and I-880 corridors, which are immediately adjacent to many residential neighborhoods and commercial businesses.

The airport improvement options at SJC would occur mostly on existing transportation, industrial, and commercial properties. However, the potential construction of runways on the eastern side of the facility would be highly incompatible with nearby existing residential neighborhoods and Santa Clara University to the west.

The Modal Alternative highway improvement options would be highly incompatible with local and regional plans that have policies favoring increased transportation alternatives and reduced dependency on the automobile. For example, the highway improvement options would support a long-term dispersed pattern of development in the Bay Area to Merced region, which would be inconsistent with local and regional land use planning objectives that promote transit-oriented development around transit nodes as the key to more orderly and sustainable growth. However, the proposed aviation improvements at OAK and SJC would both be compatible with regional RTPs and local general plans addressing airport expansion.

HST Alternative: The Hayward/Niles/Mulford UPRR option would require additional rail track through the Don Edwards San Francisco Bay National Wildlife Refuge, and the northern tunnel and tunnel under park options would require the construction of a new transportation corridor from an eastern terminus north of Merced to the intersection with the Caltrain/UPRR corridor. All three options would potentially be highly incompatible with existing land use because these new corridors would primarily pass through agricultural land and parkland, although the extensive tunnels proposed with these options would avoid most potential parkland impacts. The minimize tunnel option would also require the construction of a new transportation corridor north of Merced, which would be incompatible with existing land use because it would cross at grade through a portion of Henry W. Coe State Park. The Gilroy bypass alignment option (Morgan Hill/Caltrain/Pacheco Pass alignment) would require the construction of a new transportation corridor from its eastern terminus north of Merced to the intersection with the Caltrain/UPRR corridor just north of Gilroy. The new section between the proposed Los Banos Station and the Caltrain/UPRR corridor would have low to moderate compatibility with existing land uses as it passes at grade through agricultural lands, including the Pacheco Creek Valley and Santa Clara Valley. The Gilroy alignment option (Caltrain/Gilroy/Pacheco Pass alignment) would have similar impact levels to agricultural land. Most proposed station sites would be consistent with existing land uses. However, the proposed Gilroy Station site would be potentially incompatible with existing adjacent low-density residential uses and historic structures. Its location, however, would be consistent with policies and actions stated in the Gilroy general plan (City of Gilroy 2002) that place a high priority on strengthening and restoring the downtown area, including the development of an active multi-modal transit center. All of the proposed station sites for the HST Alternative in this region are consistent overall with local and regional plans emphasizing the development of intercity rail service, transportation alternatives, and transit-oriented development. No potentially high impacts are identified in this region.

Communities and Neighborhoods

Modal Alternative: The Modal Alternative highway improvement options would be constructed within or adjacent to existing transportation corridors and are not anticipated to create new physical barriers that would divide neighborhoods or communities.

High-Speed Train Alternative: In locations where the HST Alternative would create a new transportation corridor (such as between San Jose and Merced), the alignment would primarily pass through agricultural or open space lands and would not result in community cohesion impacts in neighborhoods. In the San Francisco to San Jose segment, the corridor would be primarily within an existing active commuter and freight corridor and therefore would not constitute any new physical barriers that would divide neighborhoods or communities. Also, proposed grade separations would not create new barriers. In the San Jose to Oakland segment, the alignment options would be constructed in a tunnel, on an aerial structure, or within an existing rail right-of-way and would not create community cohesion impacts.

Property

Modal Alternative: The highest potential for property impacts due to Modal Alternative highway improvements would occur primarily in urbanized and built-up areas, such as US-101 between San Francisco and San Jose, I-80 between Oakland and Solano County, and most of I-880. Other areas of potential high impacts include the western portion of I-580, and I-80 in the Dixon area. In these locations, the existing facility is built out to the edge of the right-of-way; expansion of these facilities would require additional right-of-way and would have a greater potential for impacting the adjacent dense development.

The lowest potential for property impacts would occur in areas where the densities of development are lower, such as I-580 west of I-5, SR-152, and US-101 south of the San Jose area. Overall, about 140 mi (225 km) of highway alignment improvements (40% of total highway length in the region) would potentially result in high property impacts, and 54 mi (87 km) of alignment (15% of total Modal Alternative highway alignment in the region) would potentially result in medium impacts. About 158 ac (64 ha) around OAK and SJC would potentially result in high property impacts, and 533 ac (216 ha) would potentially result in medium property impacts (see Figure 3.7-5).

High-Speed Train Alternative: The proposed San Jose to Merced alignment options would require new right-of-way. However, since these alignments would traverse areas with agricultural or open space land uses, they would be expected to result in a low potential for property impacts on homes or buildings. Areas of potentially higher property impacts would be expected in built-up locations where the alignments would be located adjacent to the existing transportation corridor or in a new corridor. This would occur in San Francisco south of the proposed 4th and King Station on the Caltrain alignment, and north of the proposed San Jose Station on the I-880 alignment. Between 3 mi (5 km) and 11 mi (18 km) of rail alignment and station locations in the Bay Area to Merced region (between 1% and 5% of total alignment) would potentially result in high property impacts, and between 4 mi (5km) and 9 mi (14 km) of alignment and station locations (between 2% and 5% of total alignment) would potentially result in medium land use impacts (see Figure 3.7-6). Overall, there would be a low potential for property impacts in this region because the rail improvements would be mostly contained within existing right-of-way or in new corridors that are in tunnels or traverse open space.

Environmental Justice

Modal Alternative: Substantial percentages of minority populations are located in the study area for the highway improvement options included in the Modal Alternative (with the exception of the I-580 corridor, which has 40%). For example, the US-101 corridor study area has 68% minority population, I-880 68%, SR-152 60%, and I-80 65%. The OAK and SJC airport study areas both have minority populations of 54% in their study areas.

However, the potential for disproportionate impacts would be expected to be low because most of the highway expansion would occur in the existing right-of-way and would incorporate mitigation to reduce potentially significant adverse effects.

High-Speed Train Alternative: The HST Alternative study area in this region includes a variety of neighborhoods and a diverse multiethnic population. The study areas for all of the proposed HST alignment options have substantial percentages of minority populations. For example, the San Francisco to San Jose study area has a minority population of 52%, Oakland to San Jose 71%, and San Jose to Merced 64%. Significant minority populations were also identified in the vicinity of eight proposed station locations (Los Banos, Gilroy, Santa Clara, Union City, Auto Mall Parkway, Coliseum BART, 12th Street/City Center, and West Oakland). With the exception of the San Jose to Merced alignment, the alignment options would be along existing transportation corridors, and would not be expected to result in disproportionate impacts. Because San Jose to

Merced would be a new alignment, there would be a somewhat higher potential for impacts, but impacts would be reduced through the inclusion of feasible mitigation measures.

High-Speed Train Alignment Options Comparison

The Merced to San Jose HST alignment options would be the least compatible with existing land use because these options would require the construction of a new transportation corridor from the eastern terminus near Merced to the intersection with the Caltrain/UPRR rail corridor. Land use compatibility ratings along these segments of the alignment options would range from low to medium. The minimize tunnel option in the Diablo Range direct alignment options would be the least compatible because it would cross at grade through a portion of the Henry W. Coe State Park. The Caltrain/Gilroy/Pacheco Pass alignment option would be the most compatible because it would extend further south to connect with the UPRR alignment and continue to a station at Gilroy. The Hayward/I-880 option would have a higher potential to impact residential property than the Mulford Line option. However, the Mulford Line option would impact the Don Edwards San Francisco Bay National Wildlife Refuge.

B. SACRAMENTO TO BAKERSFIELD

Land Use Compatibility

Modal Alternative: The Modal Alternative would include a wide range of highway improvements throughout the Sacramento to Bakersfield region, and expansions at the Sacramento and Fresno airports. The included changes to the transportation facilities would primarily occur at grade and involve widening of the major intercity travel routes, including changes on I-5, SR-99, SR-152, SR-33, I-80, and I-580 in this region. Because existing land use is predominantly agricultural and the improvements would involve widening of the existing right-of-way, the proposed highway and airport improvements would be potentially incompatible with surrounding land uses. About 44% of the land in the study area in this region is devoted to cropland and orchards, and more than half of the area along the roadways is designated for croplands and pasture. Residential land use comprises about 7%. About 9% of the land is designated for residential use, and a similar amount of commercial/services and industrial uses (about 7%) is proposed along the roadways.

Improvements that would involve widening of existing corridors would be potentially incompatible with future plans due to agricultural designation. The proposed widening of SR-99 would be potentially inconsistent with general plan policies that designate more than a third of land in this corridor for residential development. Similarly, more than half of the land along the I-5 corridor is designated for agricultural and natural open space uses, which would be considered incompatible with roadway improvements. In some locations that have been designated for predominantly agricultural use, the highway improvements would have a potentially high incompatibility because they would be inconsistent with general plan policies to protect and maintain agricultural production.

Future land use around Sacramento International Airport is projected to be primarily transitional uses (uses other than residential and agricultural); therefore, airport expansion would be largely compatible with future plans.

High-Speed Train Alternative: The potential effects of the proposed HST alignments would be similar to those of the Modal Alternative in that the vast majority of the land uses along the proposed right-of-way are designated agricultural. Most segments in this region would require additional right-of-way for HST, and therefore would not be compatible with existing land use. The proposed Truxton (Union Avenue) Station site was also rated as having a high potential incompatibility with existing land use. The area around the proposed station site currently contains a high percentage of low-density residential development. This station would be located in the Tulare to Bakersfield segment on the UPRR corridor. The proposed Castle Air Force Base (AFB) station site would also not be compatible with existing agricultural uses. The site is also designated for agricultural use in the City of Merced's general plan (City of Merced 1997). Castle AFB is designated for redevelopment. In the Sacramento to Stockton segment, most of the land adjacent to the eight proposed alignment options has been designated for agricultural use in general plans. Four of these alignments also traverse a high percentage of land designated for residential use and therefore would be considered to have a high potential incompatibility with land use plans. Two of these alignments would use the UPRR corridor; the other options would use the CCT corridor. Both the UPRR and CCT alignments have options to link the Sacramento Downtown Station and the Power Inn Road Station with Stockton. In general, the CCT route tends to traverse slightly more land designated for residential and agricultural use than the UPRR route, which would make the CCT route potentially less compatible with future land uses.

Between Stockton and Modesto, the alignment option that would use the UPRR corridor would pass through an area designated for a large portion of residential use (UPRR alignment to Modesto Downtown Station) and would therefore be incompatible with future land use.

Communities and Neighborhoods

Modal Alternative: For much of the Sacramento to Bakersfield region, the highway component of the Modal Alternative would involve widening I-5 and SR-99 by two lanes. Communities in the urbanized portion of Sacramento could be affected by widening I-5, but for much of its length from Sacramento to Bakersfield, I-5 is bordered by agricultural uses or highway commercial uses set back from the right-of-way. Widening SR-99, if it occurs within the existing right-of-way, would not be expected to result in a detrimental physical division of existing communities, because the existing roadway already creates a physical separation between land uses on either side of the highway. However, there are instances throughout the region where the widening would require additional right-of-way and involve displacement of adjoining land uses. The displacement of these uses could potentially increase physical separation that already exists.

High-Speed Train Alternative: For much of the Sacramento to Bakersfield region, the proposed HST routes follow existing rail lines—UPRR, BNSF, or CCT. In many cases, smaller rural communities developed along the railroad tracks. In larger communities, the rail lines already divide the community. A parallel, at-grade set of tracks for HST would therefore not generally be expected to result in a substantial increase in physical separation which exists between land uses on either side of the tracks.

Property

Modal Alternative: The highest potential for property impacts due to potential highway improvements included in the Modal Alternative would occur in the urbanized areas along I-5 and SR-99 in the vicinity of Sacramento, Stockton, Modesto, Merced, Fresno, and Bakersfield. More specifically, there would potentially be high and medium property impacts on I-5 and SR-99 in the Sacramento area and on I-5 between Sacramento and Stockton. The majority of the high-impact areas include the portion of SR-99 between Sacramento and Merced. Other areas of potentially high property impacts include areas further south on SR-99 from SR-152 to Bakersfield. The area along I-5 between Stockton and SR-99 has the potential to result in medium impacts on property. Overall, approximately 52 mi (84 km) of highway alignment (8% of total Modal Alternative highway alignment in the region) would have a high potential for property impacts, and 92 mi (153 km) of alignment (15% of total Modal Alternative highway alignment in the region) would have a medium potential for property impacts. The lowest potential for property impacts would occur in less-developed and rural areas along I-5 and SR-99 (see Figures 3.7-7 and 3.7-8).

High-Speed Train Alternative: Under the HST Alternative, areas of potentially high property impacts would occur in the vicinity of urbanized areas where the alignments would be located adjacent to an existing transportation corridor. Between Sacramento and Stockton, the proposed easterly CCT alignment traverses primarily rural lands resulting in a low property impact potential. However, there is a small section of this corridor segment approximately 10 mi (16 km) south of the Power Inn Road Station site that would potentially result in high property impacts. The Power Inn Road Station site is located adjacent to an existing corridor and would result in a medium potential for property impacts. Other areas of potentially high and medium impacts are located between Stockton and Merced along both the UPRR and BNSF alignments. These potential impacts are due to new alignments impacting existing development and alignments located adjacent to existing corridors but outside the existing right-of-way, thereby impacting existing development.

The area from Merced to Fresno is largely agricultural land and therefore the potential to impact property is low. However, potential impacts on property along the UPRR and BNSF alignments directly north of the Fresno Downtown Station and continuing south to Bakersfield would be considered high to medium due to new alignments, and because the property is adjacent to an existing corridor. Between 20 mi (32 km) and 25 mi (40 km) of rail alignment and station locations (between 6% and 8% of total HST alignment in the region) would potentially result in high property impacts, and between 23 mi (37 km) and 67 mi (108 km) of alignment and station locations (between 7% and 20% of total HST alignment in the region) would potentially result in medium property impacts (see Figures 3.7-9 and 3.7-10).

Environmental Justice

Modal Alternative: For the Modal Alternative, minority populations were identified in the Modesto to Merced corridor. Communities in this corridor include Ceres, Keyes, Turlock, Delhi, Livingston, Atwater, and Merced. In this study area for this portion of the SR 99 alignment included in the Modal Alternative, the percentage of minorities is about 46%, compared to 35% in the region as a whole. In other corridors in the Sacramento to Bakersfield region, the percentage of minority populations is lower.

High-Speed Train Alternative: For the HST Alternative, minority populations have been identified near several potential station location options. These include the proposed stations and maintenance facilities locations in the Sacramento area (downtown Sacramento Valley Station, Power Inn Road BNSF and UPRR options, and the Sacramento Maintenance Facility BNSF and UPRR options); Stockton ACE Downtown Station; the Modesto Downtown Station; both Merced station sites (Merced Downtown Station and Merced Municipal Airport Station); Fresno Downtown Station; Hanford Station; and Truxton stations (Union Avenue and Amtrak) in Bakersfield.

In addition, the alignment options between Merced and Fresno and from Tulare to Bakersfield would be expected to pass through areas with predominantly minority populations. The potential impacts, if any, for these communities would depend in part on the extent of new right-of-way that would be required for the HST Alternative. Where bypass options would be considered in addition to a mainline option, there would be greater potential for impacts.

High-Speed Train Alignment Options Comparison

The proposed Truxton (Union Avenue) Station site, which would be located in the Tulare to Bakersfield segment along the UPRR, is adjacent to a relatively high percentage of residential development, and the HST Alternative would be potentially incompatible with existing land uses. The Sacramento to Stockton corridor on the UPRR alignment is designated as predominantly agricultural and residential land uses, which would be potentially incompatible with the HST Alternative. The proposed UPRR alignment in the Stockton to Modesto corridor would also be incompatible with existing land uses due to proposed residential uses. In the Fresno to Tulare corridor, the proposed alignment along the BNSF route to Hanford Station would be potentially incompatible with existing land uses. In the Truxton to Bakersfield corridor, the proposed Truxton UPRR Station option and the main maintenance facility BNSF option would be potentially incompatible with the high percentage of land designated for future residential uses.

Minority or low-income populations exceeding 50% of the population as a whole, or 10% greater than the minority population in the community as a whole, were identified in the following alignment options and station study areas: all of the proposed sites for stations and maintenance facilities in the Sacramento to Stockton corridor, Modesto Downtown Station (Stockton to Modesto corridor on the UPRR alignment), all station areas in the Modesto to Merced corridor, Fresno Downtown Station area and all alignments in the Merced to Fresno corridor, Hanford Station area (Fresno to Tulare corridor on the BNSF corridor), Truxton (Union Station) and Truxton (Amtrak) Station areas, and most alignments in the Tulare to Bakersfield corridor.

In the Tulare to Bakersfield corridor, the proposed Truxton (Union Avenue) Station site would result in high land use incompatibility impacts. The Tulare express loop would somewhat reduce displacement impacts, but it would divide an established community.

C. BAKERSFIELD TO LOS ANGELES

Land Use Compatibility
Modal Alternative: The Modal Alternative includes potential highway improvements to I-5, SR-58, and SR-14. Widening that would require right-of-way outside of the existing corridor would be needed on most of the segments of I-5, as well as the segment of SR-14 between Palmdale and I-5. The widening of I-5 would be incompatible with the designated significant ecological areas (described in Section 3.15, *Biological Resources and Wetlands)* between SR-99 and SR-14 and other adjacent land uses. Similarly, the widening of SR-14 would be incompatible with existing agricultural and residential land uses.

The Modal Alternative would also include the expansion of the Burbank-Glendale-Pasadena Airport. Expansion of this airport would be incompatible with nearby residential neighborhoods as well as the local airport authority's plan to discontinue airport expansion.

High-Speed Train Alternative: Most of the proposed alignment options in this region would be constructed outside of existing transportation right-of-way, either highway or rail, and would require new right-of-way. The new right-of-way would generally follow the existing transportation corridor. In these locations, the alignments would be potentially incompatible with existing land uses. These locations include the I-5/Wheeler Ridge alignment option because it would not stay consistently within the SR-184 corridor and would traverse single-family residential neighborhoods and agricultural lands. A similar situation would occur with the SR-58/Soledad Canyon corridor alignment. Other alignment options that would require new right-of-way include the Palmdale Station siding (a length of track for passing trains at the Palmdale Station) and the MTA/Metrolink and combined I-5/Metrolink options, including the I-5 Burbank downtown siding, I-5 downtown Burbank to LAUS (cut and cover at Silver Lake), I-5 downtown Burbank to LAUS (aerial at Silver Lake), LAUS existing siding, LAUS existing south, LAUS south siding, LAUS existing east, and east connection.

The proposed I-5 Tehachapi Mountain crossing would also be constructed outside of an existing rail transportation right-of-way. However, the alignment would follow the existing road transportation corridor, and it would be constructed mostly within tunnels. Therefore, it would be compatible with existing uses. The section along cut and fill near Tejon Lake in Castaic Valley may be inconsistent with potential Tejon Ranch plans to build low-density residential units on lands adjacent to Tejon Lake. Two proposed HST station sites, at Sylmar and Burbank, were considered incompatible with existing land uses because they would be located in neighborhoods with a high proportion of low-density residential uses. However, these stations would be consistent with local plans to encourage mixed-use development and focus development near transit stations.

Communities and Neighborhoods

For the Modal Alternative, the included highway improvements would occur in existing transportation corridors and therefore would not create new divisions or barriers in existing neighborhoods.

For the HST Alternative, the alignment options were anticipated to have an adverse impact on community cohesion if they would divide an existing neighborhood, resulting in decreased access within the community. The new Union Avenue corridor would pass through and divide an established residential area in southern Bakersfield.

Property

Modal Alternative: The highest potential for property impacts due to Modal Alternative highway improvements would occur primarily in urbanized areas. The northern portion of this region is largely agricultural, and the potential for property impacts would be low. The central portion of this region traverses the mountains and is largely rugged and undeveloped land. This portion also crosses the high desert, including the communities of Palmdale and Lancaster. Although this segment crosses these communities, land uses remain mostly rural. The potential for property impacts in this area would also be low. Portions of the Modal Alternative along I-5 that would traverse urban development would potentially result in medium to high impacts.

Upon entering the southern portion of this region (Sylmar to Los Angeles), the land uses become a mix of suburban uses. This portion of the region contains greater potential for medium to high property impacts. Overall, 13 mi (21 km) of highway alignment (6% of total Modal Alternative highway alignment in the region) would potentially result in high property impacts, and 24 mi (39 km) of alignment (11% of total Modal Alternative highway alignment in the region) would potentially result in medium property impacts. Approximately 107 ac (43 ha) of land around the Burbank-Glendale-Pasadena Airport expansion would have a high potential for property impacts, and 350 ac (142 ha) of land around the airport would have a medium potential for property impacts (see Figure 3.7-11).

High-Speed Train Alternative: Much of the proposed I-5 and SR-58/Soledad Canyon alignments would require new right-of-way. A large majority of these alignments traverse areas with open space or agricultural land uses and would be expected to have a low potential for property impacts. However, portions of these alignments would pass through urbanized areas and would therefore have a medium to high potential for property impacts, e.g., the Sylmar to Los Angeles segment, including the alignment along I-5 between Burbank Metrolink/Media City Station and the existing LAUS. Overall, between 4 mi (6 km) and 15 mi (24 km) of rail alignment and station options (between 3% and 11% of total HST alignment in the region) would potentially result in high property impacts, and between 4 mi (6 km) and 15 mi (24 km) of alignment and station locations (between 4% and 11% of total HST alignment in the region) would potentially result in medium property impacts. The higher numbers generally reflect inclusion of impacts along the Antelope Valley route (see Figure 3.7-12).

Environmental Justice

Modal Alternative: For the Modal Alternative, minority populations exist in the study area for the I-5 corridor from SR-14 to LAUS and along the SR-58/SR-14 corridor (with an average minority population percentage of 75%), and at other locations such as the I-5/SR-14 to I-405 and the SR-58/SR-14/SR-99 to Palmdale corridors. However, the highway improvements in these locations would be constructed within the existing right-of-way, which would reduce potential for adverse impacts. Potential for impacts would be greater where new right-of-way would be needed. The population of the study area around the Burbank-Glendale-Pasadena Airport comprises about 80% minorities. The need for additional right-of-way to expand the airport could result in potential impacts.

High-Speed Train Alternative: Minority populations are located in the study area at points along all of the alignment options. For example, the average percentage of minority population for the I-5 Tehachapi Mountain crossing (Wheeler Ridge and Union Ave), Palmdale Station location, and Soledad Canyon alignment is 73%. The potential for impacts would be greater for alignments that would be new transportation corridors. These segments include Wheeler Ridge corridor, SR-58 corridor, Palmdale Station, I-5 Burbank downtown station; I-5 Glendale, I-5 downtown Burbank to LAUS (aerial at Silver Lake), LAUS existing site, LAUS existing south, LAUS south, LAUS existing east, and the east connection.

Minority populations are present in the study areas for the proposed HST stations and the proposed Los Angeles maintenance yard site.

High-Speed Train Alignment Options Comparison
In the Bakersfield to Sylmar segment of the region, the proposed I-5 (Union Avenue and Wheeler Ridge) options would be potentially more compatible with existing land use than the SR-58 option because they would be either within tunnels or would not pass close to low-density residential uses or other sensitive uses, and they do not include proposed stations.

The Sylmar to Los Angeles segment includes two proposed alignment options: MTA/Metrolink or combined I-5/Metrolink. Most of the MTA/Metrolink option would be within an existing rail transportation corridor. Of the three stations proposed for this option, only Burbank Downtown Station would be located in an area with a low percentage of residential uses. Therefore, this alignment option would be moderately incompatible with existing land uses.

There are three proposed alignment options in the downtown Burbank to Los Angeles segment of the region. The I-5 Burbank downtown station option would have potentially high incompatibility because most of this option would not be within an existing transportation corridor and would be above ground as it cuts through low-density residential neighborhoods. However, the proposed I-5 downtown Burbank to LAUS (cut and cover at Silverlake) alignment would be potentially compatible because it would be constructed in tunnel. The proposed Metrolink/UPRR option would also have low incompatibility with existing land uses.

D. LOS ANGELES TO SAN DIEGO VIA INLAND EMPIRE

Land Use Compatibility
Modal Alternative: The Modal Alternative would include highway-widening improvements to I-10, I-15, I-215, I-15, and SR-163. Highway improvements in the LAUS to March ARB segment of the region would not be compatible with existing land use, which includes a high percentage of low-density residential development. Also, large portions of this segment are currently vacant and undeveloped. Expansion of the highway system would be expected to promote sprawl and low-density development and would not be compatible with local plans supporting high-density and transit-oriented development. Similarly, the segment between March ARB and Mira Mesa would also be incompatible with existing land use and future local plans. More than half of the study area in the Mira Mesa to San Diego segment consists of parklands or undeveloped land.

Therefore, the highway improvements in this segment would be incompatible with existing land use and future land use plans.

The Ontario International Airport is located in the LAUS to March ARB segment. Expansion of this airport would be incompatible with existing nearby residential neighborhoods.

High-Speed Train Alternative: Most of the proposed alignment options would be located within or adjacent to existing or planned highway or rail corridors. Two of the three proposed alignment options (UPRR Colton Line and UPRR Riverside/UPRR Colton) from Los Angeles would be located adjacent to the UPRR corridor in urbanized areas, which would be compatible with existing land use. The third option (the loop through San Bernardino) would traverse low-density residential neighborhoods and would be potentially incompatible with existing land uses. However, the San Bernardino Station would be located in a redevelopment area, and the HST Alternative would be compatible with future planned uses at this location.

This region includes one proposed alignment option to connect March ARB with Mira Mesa, and two proposed options for passing through the City of Escondido. The Escondido at SR-78/I-15 Station option would traverse mainly vacant and agricultural lands. This alignment would be located in the existing I-15 corridor and would be moderately compatible with existing land use. For the second option (Escondido Transit Center Station), the largest single land use in the corridor is single-family residential, followed by multifamily and commercial and office space. Although the large presence of residential uses is less compatible with HST, the potential for intra-city connectivity at the existing Escondido Transit Center makes this alignment moderately compatible.

For the third segment connecting Mira Mesa with San Diego, there are three proposed alignment options. The variety of land use along the options via Carroll Canyon and to Qualcomm Stadium via the I-15 corridor reflects the suburban nature of northern San Diego. Undeveloped land and parkland comprise a significant share of the land use along the alignments. All three options would follow existing transportation corridors and therefore would be moderately compatible with existing land use. The alignment option via Miramar Road would not include any stations. The majority of surrounding land use is institutional. Secondary uses are light industrial and undeveloped land. Although the alignment would also traverse the Miramar Memorial Golf Course, it would be located within an existing transportation corridor; therefore, the alignment would be moderately compatible with existing land use.

The two proposed station sites that would be potentially incompatible with surrounding land uses are South El Monte Station and City of Industry Station. This potential incompatibility is due to the more agricultural and residential nature of the areas surrounding the station locations. The proposed Escondido Transit Center Station site would be potentially incompatible with its location in an area of existing residential uses; however, the site would be compatible with local land use plans that support transit development in this area.

Communities and Neighborhoods

Modal Alternative: The Modal Alternative is not anticipated to result in any community cohesion impacts because all of the improvements would occur in existing transportation corridors.

High-Speed Train Alternative: The HST Alternative is not expected to result in any community cohesion impacts because the proposed alignments under consideration would be located in existing transportation corridors and in tunnels.

Property

Modal Alternative: The highest potential for medium to high property impacts would occur in the developed Los Angeles area from Los Angeles to San Bernardino (along I-10). The edge of this right-of-way is densely developed with commercial and residential uses. High to medium property impacts would also potentially occur along I-10, I-15, and I-215 alignments due to residential development. Much of the area in the southern section of this region is occupied by undeveloped and agricultural land. Potential property impacts on those land uses would be low. Overall, 44 mi (71 km) of highway alignment (37% of total Modal Alternative highway alignment in the region) would potentially result in high property impacts, and 44 mi (71 km) of alignment (37% of total Modal Alternative highway alignment in the region) would potentially result in medium property impacts. The Ontario Airport and Lindberg Field expansions would affect 445 ac (180 ha) of high-impact land uses and 142 ac (57 ha) of medium-impact land uses (see Figure 3.7-13).

The major land uses between LAUS and March ARB Station consist of low-density residential buffered from nearby rail corridors by commercial and industrial uses. Much of the alignment is also assumed to be adjacent to the existing highway corridor in this section and therefore is expected to result in mostly high and some medium property impacts. The area from March ARB Station to Mira Mesa Station primarily consists of open space; therefore, potential property impacts would be low. However, there are several areas located adjacent to existing corridors and new alignments that have a potential for medium to high property impacts. Between Mira Mesa Station, Downtown San Diego Station, and the Qualcomm Stadium Station, urban development increases as the alignments travel south, resulting in the potential for medium to high property impacts. There would be a medium potential for property impacts if the Qualcomm Stadium Station were located on the eastern side near multifamily residences.

Between 28 mi (45 km) and 37 mi (60 km) of rail alignment and station locations (between 19% and 22% of total HST alignment in the region) would result in potentially high property impacts, and between 35 mi (56 km) and 54 mi (87 km) of alignment and station locations (between 23% and 33% of total HST alignment in the region) would potentially result in medium property impacts (see Figure 3.7-14).

Environmental Justice

Modal Alternative: Minorities comprise 58% of the population in the study area from LAUS to March ARB. From March ARB to Mira Mesa, the minority population is 27%, and from Mira Mesa to San Diego it is 37%. Because the widening of highways would occur within the existing right-of-way, the potential for impacts would be low; however, for improvements that would need new alignment or required extensive additional right-of-way, the potential for impacts would be greater.

High-Speed Train Alternative: In this region, the HST Alternative would be located mostly within existing transportation corridors, which would limit potential the impacts on nearby communities, but potential for impacts would be greater where new right-of-way would be needed for an alignment option. Minority populations averaging 54% were identified along all of the proposed alignment options connecting Los Angeles to March ARB, including the Pomona (59%) and San Bernardino Station sites (59%), and the March ARB and Escondido Transit Center Station sites (68%) in the March ARB to Mira Mesa segment.

High-Speed Train Alignment Options Comparison

The UPRR Colton Line alignment option in the Los Angeles to March ARB segment and the I-15 alignment option in the March ARB to Mira Mesa segment would be moderately incompatible with existing land use. The Carroll Canyon alignment option in the Mira Mesa to San Diego segment also would be moderately incompatible with existing land use. However, these alignment options would be compatible with local plans. These alignments and station locations likely would provide better intercity to intra-city transit connections and would serve larger travel markets. Potential property impacts would be moderate in all of the Los Angeles to March ARB segments. In the Mira Mesa to San Diego corridor, the I-15-to coast via Carroll Canyon segment would have moderate potential property impacts, and the I-15 to coast via Miramar Road segment would have low potential property impacts.

E. LOS ANGELES TO SAN DIEGO VIA ORANGE COUNTY

Land Use Compatibility

Modal Alternative: The Modal Alternative would include the potential addition of nine gates at the Long Beach Airport and the widening of I-5 between Los Angeles and San Diego. The airport expansion would not impact surrounding land uses and would be compatible with existing and planned uses. The established I-5 corridor traverses urban and suburban mixed-use areas and crosses open space and coastal lagoons. The segments of I-5 under residential use are between Encinitas and Solana Beach, Oceanside and Carlsbad, Dana Point and San Clemente, and LAUS and Irvine. Because the highway corridor is established, it is considered compatible with existing land uses and with local plans that continue to recognize I-5 as a major transportation corridor throughout the region, and the improvements, which would be in the corridor, would also be compatible.

High-Speed Train Alternative: Proposed improvements to the LAUS to LAX segment would occur in an existing rail corridor. The existing land uses along this alignment are dominated by industrial and commercial development. Residential land uses in the study area are typically buffered from the rail by non-residential uses. Therefore, the proposed improvements would be compatible with existing and future land uses.

There are two alignment options that would travel south out of LAUS. The first option, connecting LAUS to Anaheim, would use the existing UPRR corridor, and the existing LOSSAN corridor, south of Anaheim to Irvine. Existing land uses along this alignment consist of a mixture of industrial, commercial, and residential. This alignment includes a station option in a commercial area of Norwalk with residential use and a community park located on the opposite side of the rail corridor. With the proximity of the park, the station option would have medium compatibility with land use. However, the alignment and station are generally compatible with existing land use, and they would be compatible with local land use policies to promote the enhancement of transit services and reduction of dependency on automobile use for visitors and residents.

The second alignment option traveling south out of LAUS would connect LAUS to Irvine and would be located adjacent to the existing LOSSAN corridor. Improvements would be made at the existing stations (Norwalk, Anaheim, and Irvine). Impacts on existing land uses along the alignment would be similar to those of conventional rail improvements along this section. The improvements proposed along the established rail route and around the existing stations appear to be compatible with existing and future land use.

Communities and Neighborhoods

Modal Alternative: The Modal Alternative would widen an existing transportation corridor around which neighborhoods and communities have been established. Since the corridor already exists, it is not expected that this alternative would divide any existing neighborhoods or otherwise substantially change the nature of the communities in the area. Improvements at the Long Beach Airport would have no impact on existing neighborhoods.

High-Speed Train Alternative: Under the HST Alternative, no new physical barrier to neighborhood interaction would be created. The existing residential areas along the alignment were developed with the railroad already in place, and the proposed HST system would not increase the barrier effect. Because the entire alignment would be grade separated, existing barriers at intersections with major cross streets would be eliminated, which would be a beneficial impact.

Property

Modal Alternative: The highest potential for property impacts due to Modal Alternative highway improvements would occur primarily in developed, urbanized areas. The LOSSAN region is primarily urbanized and consists of residential, commercial, and industrial land uses. High to medium property impacts are anticipated along I-5 from Los Angeles to San Juan Capistrano, and along I-5 from San Juan Capistrano to San Diego. The Camp Pendleton area along I-5 is undeveloped, and the alignment in this area would have a low property impact. There is potential for high property impacts along 59 mi (95 km) of highway alignment (28% of total highway alignment in the LOSSAN region) and potential for medium property impacts along 75 mi (121 km) of alignment (36% of total highway alignment distance in the LOSSAN region). The Lindberg Field expansion would affect 438 ac (177 ha) of high impact land uses and 10 ac (4 ha) of medium impact land uses (see Figure 3.7-15).

High-Speed Train Alternative: Under the proposed HST Alternative, no more than 2 mi (3 km) of rail alignment and station locations (1% or less of total alignment distance in the LOSSAN region) would have a high potential for property impact, and no more than 2 mi (3 km) of alignment and station locations (1% or less of alignment distance in the LOSSAN region) would have a medium potential for property impacts. The impacts would occur primarily in the vicinity of the LAX and , Anaheim sites. These impacts would be due to new alignments within this region (see Figure 3.7-16). However, because HST alignment options would use existing right-of-way, the overall potential for property impacts would be reduced.

Environmental Justice

Modal Alternative: A high percentage of minorities live within 0.25 mi (0.40 km) of I-5 in Los Angeles County. The minority population in this area is about 72%, slightly higher than the Los Angeles County average of 69%. The Modal Alternative would involve widening the existing established transportation corridor and would have low potential for impacts.

HST Alternative: The minority populations around the proposed Norwalk (UPRR corridor) and Anaheim Stations are approximately 81% and 59%, respectively. The Norwalk Station would be located along an existing rail corridor. The proposed new station at Anaheim would be underground. The potential for impacts at these stations would be low.

Minority populations were also identified in the study area along the proposed LAX to LAUS (99%) and LAUS to Irvine alignments (74%). However, the potential for impacts along these alignments would be expected to be low because the proposed alignments are along existing operating rail corridors, and because residential land uses located within 0.25 mi (0.40 km) of the rail corridor are typically buffered from the rail by non-residential uses.

Significant minority populations exist along the proposed LAUS to Irvine alignment (74%). However, the potential for impacts along these alignments would be expected to be low, because potential improvements would occur along an existing operating rail corridor, and because residential uses that are located within 0.25 mi (0.40 km) of the rail corridor are typically buffered from the rail by non-residential uses.

High-Speed Train Alignment Options Comparison

For the HST Alternative, the alternative routing options for high-speed rail between LAUS and Irvine present approximately the same potential for impacts related to land use. Because both options would occur within existing right-of-way, both options would have a low potential for impacts on existing land use. These impacts would be similar to those of conventional rail in this alignment. The LOSSAN corridor alignment would have higher potential connectivity and accessibility and compatibility with existing and planned development.

3.7.5 Design Practices

The Authority is committed to utilizing existing transportation corridors and rail lines in for the proposed high-speed rail system in order to minimize the need for additional rights -of -way and the associated potential property impacts. Nearly 70% percent of the adopted preferred HST alignments are either within or adjacent to a major existing transportation corridor (existing railroad or highway right-of-way). To a large extent, these existing transportation corridors already present barriers and impose other impacts on existing communities. Although the HST system would often introduce an additional (fenced) barrier, the HST systems would at least maintain and in many cases improve existing access conditions through the grade separation of existing services. Moreover, portions of the alignment would be on aerial structure or in tunnel, allowing for vehicular or pedestrian access across the alignment.

The Authority has also adopted strategies for HST stations that would incorporate transit oriented design and smart growth land use policies as described in Chapter 6B.

3.7.6 CEQA Significance Conclusions and Mitigation Strategies

Based on the analysis above, and considering the CEQA Appendix G thresholds of significance for land use and planning, the HST alternative would have a potentially significant impact on land use compatibility when viewed on a system-wide basis. While every effort has been made to incorporate alignment and station options that are compatible with existing local land use plans and ordinances to the extent feasible, in many cases local plans and ordinances do not address transportation options such as the high speed train system. In addition, many local land use plans and ordinances have not been updated for several years, and may be updated over time to acknowledge and support implementation of a high speed train system. The potential for land use incompatibility is considered significant at this programmatic level due to the uncertainties involved, however, such impacts may not be realized over the 20-year time horizon for implementing the high-speed train system. Regardless, mitigation strategies, as well as the design practices discussed in section 3.7.5, will be applied to reduce this impact, and the lead agencies will work closely with local government agencies in implementing these strategies.

The analysis in this Program EIR/EIS compares potential impacts from the alternatives and the HST alignment, station, and maintenance options. Potential impacts have been considered on a broad scale and on a system-wide basis. If a decision is made in the future to proceed with the proposed HST system, project-level review would analyze the potential for localized impacts.

A. LAND USE COMPATIBILITY

Local land use plans and ordinances would be further considered in the selection of alignments and station locations. Project-level review would consider consistency with existing and planned land use, neighborhood access needs, and multi-modal connectivity opportunities.

Potential mitigation strategies to alleviate or minimize land use related impacts associated with the HST Alternative might include, but are not limited to the following:

- Coordinate with the cities and counties in each region to ensure that project facilities would be consistent with land use planning processes and zoning ordinances.
- Establish requirements for station area plans and opportunities for transit oriented development. See Chapter 6B.

B. COMMUNITIES AND NEIGHBORHOODS

If a decision is made to go forward with the proposed HST system, alignments would be refined in consultation with local governments and planning agencies, with consideration given to minimizing barrier effects in order to maintain neighborhood integrity. Potential mitigation strategies to reduce the effects of any new barriers would be considered at the project-level environmental review and could include grade separating planned rail lines and streets, new pedestrian crossings, new cross-connection points, improved visual quality of project facilities, and traffic management plans to maintain access during and after construction.

In addition, mitigation measures would also be developed for temporary construction-related impacts on any nearby neighborhoods and communities. Potential mitigation strategies to alleviate or minimize community cohesion related impacts associated with the HST Alternative might include, but are not limited to the following:

- Provide opportunities for community involvement early in project level studies.
- Design workshops shall be held within each affected neighborhood to develop an understanding of key vehicle, bicycle, and pedestrian linkages across the rail corridor so that those linkages can be preserved, including the use of grade-separated crossings.
- Develop facility, landscape, and public art design standards for project corridors that reflect the character of adjacent affected neighborhoods.
- Ensure that connectivity (pedestrian/bicycle and vehicular crossings) across the rail corridor is maintained where necessary to maintain neighborhood integrity.
- Develop traffic management plan to reduce barrier effects during construction.
- To the extent feasible, maintain connectivity during construction.
- Maintain high level of visual quality of project facilities in neighborhood areas by implementing such measures as visual buffers, trees and other landscaping, architectural design and public artwork.

C. PROPERTY

Potential land use displacement and property acquisition (temporary use and/or permanent and non-residential property) are expected to be avoided to the extent feasible by considering further alignment adjustments and design changes in the future at the project level. In addition, analysis at the project level would consider relocation assistance in accordance with the Federal Uniform Relocation and Real Property Acquisition Policies Act of 1970. Design strategies would be developed for application at the project level to avoid or minimize the temporary or permanent acquisition of residential and non-residential property.

Access modifications including possible over or under crossings may be needed to mitigate impacts arising from partial property acquisitions that result in division of a farm or other land use.

D. ENVIRONMENTAL JUSTICE

On a system-wide basis, it is not expected that the proposed HST system would result in disproportionate adverse effects to minority or low-income populations. If a decision is made to pursue the development of the proposed HST system, additional consideration of environmental justice issues would occur during project-level review, which would include consideration of potential localized impacts and potential benefits to and enhancements for communities along potential HST alignments. Project-level review would include consideration of detailed mitigation measures, including mitigation for temporary construction-related impacts. Project-level review would also include outreach to potentially affected communities as part of the public review process.

Potential mitigation strategies to alleviate or minimize land use related impacts associated with the HST Alternative might include, but are not limited to the following:

EO 12898 requires federal agencies to ensure effective public participation and access to information. Consequently, a key component of compliance with EO 12898 is outreach to the potentially affected minority and/or low-income population to discover issues of importance that otherwise may not be apparent. Outreach to affected communities would be conducted as part of the decision-making process, and this outreach would be documented.

In addition to examining all impacts, specific attention would be given to the permanent impact categories that are commonly of concern for this type of project and to those that previously have been identified as being of concern. These include:

- Air quality
- Noise and vibration
- Public health
- Visual/aesthetics
- Parklands
- Relocation

The above mitigation strategies are expected to reduce the land use compatibility impacts of the HST alternative to a less-than-significant level. Additional environmental assessment will allow a more precise evaluation in the second-tier, project-level environmental analyses.

3.7.7 Subsequent Analysis

Should the HST Alternative be selected, the subsequent environmental evaluations and project-level review of proposed segments and facilities would address the need for the following studies.

- Land use studies for specific alignment and station areas potentially impacted, including evaluation of potential land use conversion, potential growth, and potential community benefits.
- Review of localized potential environmental justice issues.
- Relocation impact analysis for potentially displaced housing and businesses.
- Pedestrian and vehicular circulation studies.

3.8 AGRICULTURAL LANDS

Agricultural lands considered in this environmental document are those included in the State of California Department of Conservation's Farmland Mapping and Monitoring Program (FMMP). (Government Code § 65570) FMMP-listed agricultural resource categories include prime farmland, farmland of statewide importance, unique farmland, and farmland of local importance. This section generally describes the existing farmland locations and agricultural resources in the five project regions, and identifies potential impacts related to converting farmland to non-agricultural use for each alternative and high-speed train (HST) option. Severance of farmland, insofar as it is a potential impact on a working landscape, is also discussed in this section.

3.8.1 Regulatory Requirements and Methods of Evaluation

A. REGULATORY PROVISIONS

Many regulatory and non-regulatory strategies are used to discourage farmland conversion (i.e., the conversion of land in agricultural use to non-agricultural use). In addition, there are many non-regulatory strategies used to prevent farmland conversion. CEQA provides that significant effects on the environment of agricultural land conversions be considered in the environmental review process (P.R.C. § 21060.1 and CEQA Guideline § 21095[a]).

<u>Farmland Mapping and Monitoring Program</u>
FMMP is the only statewide land use inventory conducted on a regular basis. California Department of Conservation administers the FMMP, under which it maintains an automated map and database system to record changes in the use of agricultural lands. Farmland under the FMMP is listed by category—prime farmland, farmland of statewide importance, unique farmland, and farmland of local importance. Information regarding locations of farmland by category is readily available. Conversely, farmland sought to be protected by various other strategies, some of which are discussed below, can be more difficult to identify because they are listed and administered locally, and may use different criteria. Because of these considerations, this document uses only the FMMP-protected farmland categories for estimating potential impacts on farmland. The farmland categories listed under the FMMP are described below. The categories are defined pursuant to U.S. Department of Agriculture (USDA) land inventory and monitoring criteria, as modified for California.

- <u>Prime Farmland</u>. Prime farmland is land with the best combination of physical and chemical features to sustain long-term production of agricultural crops. These lands have the soil quality, growing season, and moisture supply necessary to produce sustained high yields. Soil must meet the physical and chemical criteria determined by the USDA's Natural Resources Conservation Service (NCRS). Prime farmland must have been used for production of irrigated crops at some time during the 4 years prior to the mapping date by the FMMP.
- <u>Farmland of Statewide Importance</u>. Farmland of statewide importance is similar to prime farmland but with minor differences, such as greater slopes or a lesser ability of the soil to store moisture. Farmland of statewide importance must have been used for production of irrigated crops at some time during the four years prior to the mapping date.
- <u>Unique Farmland</u>. Unique farmland is of lesser quality soils than prime farmland or farmland of statewide importance. Unique farmland is used for the production of the state's leading agricultural crops. These lands are usually irrigated but may include non-irrigated orchards or vineyards found in some climatic zones in California. Unique farmland must have been used for crops at some time during the four years prior to the mapping date.

- Farmland of Local Importance. Farmland of local importance is farmland that is important to the local agricultural community as determined by each county's board of supervisors and local advisory committees.

Federal Farmland Protection Policy Act

The USDA's NRCS oversees the Farmland Protection Policy Act (FPPA) (7 U.S.C. § 4201 *et seq.*; see also 7 C.F.R. part 658). The FPPA (a subtitle of the 1981 Farm Bill) is national legislation designed to protect farmland. The FPPA states its purpose is to "minimize the extent to which federal programs contribute to the unnecessary conversion of farmland to nonagricultural uses." The FPPA applies to projects and programs that are sponsored or financed in whole or in part by the federal government. The FPPA does not apply to private construction projects subject to federal permitting and licensing, projects planned and completed without any assistance from a federal agency, federal projects related to national defense during a national emergency, or projects proposed on land already committed to urban development. The FPPA spells out requirements to ensure federal programs to the extent practical are compatible with state, local, and private programs and policies to protect farmland, and calls for the use of the Land Evaluation and Site Assessment (LESA) system to aid in analysis. Because the proposed HST Alternative may ultimately seek some federal funding, the FPPA is considered in this document.

Williamson Act

The California Land Conservation Act (Government Code §51200 et seq.) of 1965, commonly known as the Williamson Act, provides a tax incentive for the voluntary enrollment of agricultural and open space lands in contracts between local government and landowners. The contract enforceably restricts the land to agricultural and open space uses and compatible uses defined in state law and local ordinances. an agricultural preserve, which is established by local government, defines the boundary of an area within which a city or county will enter into contracts with landowners. Local governments calculate the property tax assessment based on the actual use of the land instead of the potential land value assuming full development.

Williamson Act contracts are for 10 years and longer. The contract is automatically renewed each year, maintaining a constant, ten-year contract, unless the landowner or local government files to initiate nonrenewal. Should that occur, the Williamson Act would terminate 10 years after the filing of a notice of nonrenewal. Only a landowner can petition for a contract cancellation. Tentative contract cancellations can only be approved after a local government makes specific findings and determines the cancellation fee to be paid by the landowner.

The State of California has the following policies regarding public acquisition and locating public improvements on lands in agricultural preserves and on lands under Williamson Act contracts (Government code §51290-51295).

- State policy to avoid location of any federal, state, or local public improvements and any improvements of public utilities, and the acquisition of land, in agricultural preserves.

- State policy to locate public improvements that are within agricultural preserves on land other than land under Williamson Act contract.

- State policy that any agency or entity proposing to locate such an improvement, in considering the relative costs of parcels of land and the development of improvements, give consideration to the value to the public of land, particularly prime agricultural land, within an agricultural preserve.

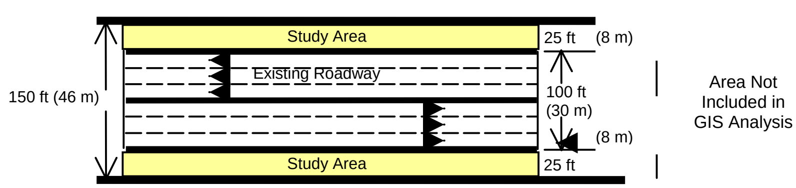
Conservation Easements
Conservation easements are voluntarily established restrictions that are permanently attached to property deeds, with the general purpose of retaining land in its natural, open-space, agricultural or other condition, while preventing uses that are deemed inconsistent with the specific conservation purposes expressed within the easements. Agricultural conservation easements define conservation purposes that are tied to keeping land available for continued use as farmland. Such farmlands remain in private ownership and the landowner retains all farmland use authority, but the farmland is restricted in its ability to be subdivided or used for non-agricultural purposes such as urban uses. The Division's California Farmland Conservancy Program (Public Resources Code §10200 et seq.) supports the voluntary granting of agricultural conservation easements from landowners to qualified non-profit organizations, such as land trusts, as well as local governments.

B. METHOD OF EVALUATION OF IMPACTS

Method of Determining Study Areas
Modal Alternative: It was assumed that all existing roadways potentially affected by the Modal Alternative have an average right-of-way width of 100 ft (30 m). This assumption was verified by aerial photographic analysis of the roadways that exist in agricultural areas that would be improved under the Modal Alternative. All roadway segments in the aerial photos that exceed the 100-ft (30-m) width assumption were observed to either have sufficient space to add lanes to the center portion of the roadway, or were not located near agricultural areas. The 100-ft existing roadway was excluded from geographic information systems (GIS) analysis under the assumption that no farmland impacts could occur within the right-of-way of an existing roadway.

The Modal Alternative, as defined in Chapter 2, would add one lane to each direction of travel to I-5, I-10, I-15, I-80, I-215, I-280, I-580, I-880, SR-14, SR-99, SR-152, and US-101. The Modal Alternative would also add two lanes to each direction of travel on I-5 through Los Angeles. A Caltrans standard lane width is 12 ft (3.65 m). Considering this, the study area was determined to extend from the edge of the existing right-of-way to 25 ft (8 m) on both sides of existing right-of-way. The 25-ft (8-m) distance is assumed to accommodate the added lanes with shoulders or other required additions. This approach is illustrated below in Figure 3.8-1.

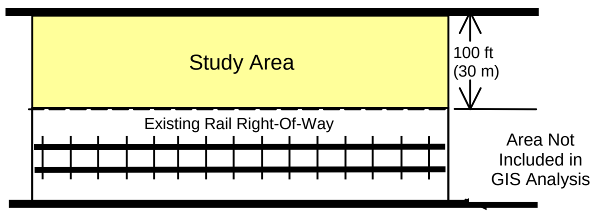
Figure 3.8-1
Modal Alternative Study Area (Highways)



Potential farmland impacts related to the Modal Alternative airport improvements were evaluated by applying the design footprint of the facility (e.g., runway) being improved over the FMMP GIS shapefiles and calculating the impacts on the FMMP-listed farmland. The study area for the region's airports included the land required to develop the proposed improvements to runways, taxiways, and terminals. This method assumed that the potential impact was limited to the geographic extent of area needed for the improvements only, with no extra area surrounding them.

High-Speed Train Alternative: The study area for the HST Alternative was developed to address two different potential improvement scenarios. The first scenario was for potential alignment options adjacent to existing rail corridors. In these cases, the study area extended 100 ft (30 m) from the rail right-of-way on the side that was selected for study by the California High Speed Rail Authority (Authority) and its regional study teams based on conceptual engineering studies. This allows the development of an estimate of the area that could be needed for a proposed HST system, and an estimate within that area of the land now in agricultural use that would potentially be affected. This approach is illustrated below in Figure 3.8-2.

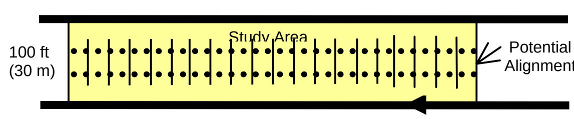
Figure 3.8-2
High-Speed Train Alternative Study Area
(in Existing Railway Areas)



This case represents a conservative approach to quantifying potential impacts, since it would be possible to fit the HST within a 50-ft (15-m) right-of-way in areas of high agricultural impact. Moreover, it may be possible to fit the entire HST line into existing rail corridors, given agreements with private rail operators. To the extent this could be done, it would reduce the potential impacts of the proposed HST Alternative to a nearly negligible level of impact on agricultural lands in existing railway areas.

The second scenario was developed for new alignments in undeveloped areas (i.e., areas outside the urban/metropolitan area that do not have existing rail rights-of-way) that are separate from existing rail corridors. In this scenario, the study area would extend 50 ft (15 m) on both sides of the proposed rail centerline, for a total width of 100 ft (30 m). This is a conservative approach because it would be possible to fit the HST line within a 50-ft (15-m) right-of-way in constrained areas. This approach is illustrated below in Figure 3.8-3.

Figure 3.8-3
High-Speed Train Alternative Study Area
(in Undeveloped Areas)



Analysis of Impacts

To ascertain the possible extent of potential farmland impacts, the Modal and HST Alternative study areas were overlain atop the FMMP farmland GIS shapefile. The GIS then calculated the acreage of farmland that would potentially be converted for the Modal Alternative improvements and the HST Alternative improvements in the study area for each of the FMMP categories. This analysis was performed for each region and used to calculate potential system-wide impacts on farmlands. This analysis accounts for proposed improvements that would expand existing transportation corridors, potential alignments that are adjacent to existing transportation corridors, and potential alignments that would traverse undeveloped areas. The station facilities that would be included within the proposed HST Alternative are assumed to be located primarily within the study areas considered.

Improvements associated with the Modal Alternative would consist of lane additions to existing roadways, as well as additional runways, gates, and associated improvements at existing airports. Considering this, the Modal Alternative identifies improvements for specific routes as part of the overall system-wide improvement alternative. The HST Alternative represents an alternative with various alignment options within each region. While potential impacts were estimated for each alignment option, the analysis for the HST Alternative was developed to ascertain alignment combinations that would result in the least potential impacts on agricultural land per region (LPI) and alignment combinations that would result in the greatest potential impacts per region (GPI). Alignment combinations other than the LPI and GPI would be expected to have levels of impact between that of the LPI and GPI.

For purposes of this discussion, *farmland severance* is defined as the division of one farmland parcel into two or more areas of operation by the placement of a barrier (in this case rail line) through the parcel. Potential severance locations are discussed qualitatively, not quantitatively, in this program-level document. Parcel-specific information is also not considered in this program-level analysis. Project-level farmland conversion and severance impacts that are determined to be significant adverse impacts would be addressed in subsequent project-level documents.

3.8.2 Affected Environment

The locations of Modal Alternative and HST Alternative improvements in relation to the general locations of existing agricultural resources are shown in Figures 3.8-4A, 3.8-4B, 3.8-5A, and 3.8-5B.

A. STUDY AREA DEFINED

The study area for agricultural lands is defined above in Section 3.8.1 B.

B. GENERAL DISCUSSION OF AGRICULTURAL LANDS

California is the leading agricultural producer and exporter in the U.S. In 2001, California's agricultural production reached $27.6 billion, accounting for approximately 13% of the nation's gross cash receipts. The most recent statistics (2001) indicate that California has approximately 27.7 million acres (ac) (11.2 hectares [ha]) of land in farms, has approximately 88,000 farms (approximately 4% of the nation's total), and produces more than 350 different crop types. Although California has many areas of farmland production, its largest area of agricultural production is the Central Valley. Six out of the top ten California agricultural counties in 2001 were located in the Central Valley. (American Farmland Trust 2003, California Department of Food and Agriculture 2002.)

Urban growth frequently results in the conversion of agricultural land to non-agricultural uses. According to an estimate in a May 2001 report by the University of California Agricultural Issues Center, California lost approximately 497,000 ac (201,000 ha) of farmland by urbanization in the decade between 1988 and 1998, a loss rate of approximately 49,700 ac (20,100 ha) per year (Kuminoff, Sokolow, and Sumner 2001).

C. AGRICULTURAL LANDS BY REGION

Bay Area to Merced

This region includes central California from the San Francisco Bay Area (San Francisco and Oakland) south to the Santa Clara Valley and east across the Diablo Range to the Central Valley.

The majority of FMMP-listed farmland in the Bay Area to Merced region is located in the eastern portion of the region at the west side of the Central Valley. A smaller amount of FMMP-listed farmland is located in the Santa Clara Valley between San Jose and Gilroy. These areas are mostly prime farmland; smaller areas of farmland of statewide importance and farmland of local importance are also present.

<u>Modal Alternative</u>: The existing roadways relevant to the Modal Alternative in this region are I-80, I-580, I-880, US-101, and SR-152. I-80 travels through farmland areas in the northeastern portion of the Central Valley. I-580 (at its eastern end) travels through farmland areas in the northeastern portion of the Central Valley. I-880 travels through primarily urban areas in the eastern portion of the lower San Francisco Bay; agricultural uses are present but minimal along this roadway. US-101 travels through the agricultural areas in the southern portion of the Santa Clara Valley. SR-152 winds from the south portion of the Santa Clara Valley in an east-northeast direction to the Central Valley near the community of Los Banos. Agricultural lands along SR-152 are located in the southern portion of the Santa Clara Valley and on the eastern portion of the Central Valley.

<u>High-Speed Train Alternative</u>: HST Alternative alignment options in this region would begin at either San Francisco or Oakland, turn eastward at either San Jose (the Diablo Range direct alignment option) or Gilroy (the Pacheco Pass alignment option) and continue to Merced. There are negligible areas of farmland along these potential alignments between San Francisco and San Jose, and Oakland and San Jose. As indicated above, farmland in this region is primarily located in the eastern part of the region along the western areas of the Central Valley, and secondarily within the Santa Clara Valley south of San Jose. The mountainous topography along the Diablo Direct and Pacheco Pass alignment options between the Santa Clara and Central Valleys permits little agriculture besides grazing. However, grazing lands are not included in this program-level review. Grazing lands and other lands not included in the FMMP would be analyzed in the project-level review.

<u>Sacramento to Bakersfield</u>

This region of central California includes a large portion, approximately 75%, of the Central Valley (San Joaquin Valley) from Sacramento south to Bakersfield. The Central Valley is an active agricultural region. It contains some farmland in each of the FMMP-categories considered in this analysis. The largest FMMP farmland category represented in the Central Valley region is generally prime farmland, followed by farmland of statewide importance, then unique farmland, and, finally, farmland of local significance.

<u>Modal Alternative</u>: The existing roadways relevant to the Modal Alternative in this region are I-5, I-80, SR-99, and SR-152. Agricultural areas are located along the majority of the length of I-5 from Sacramento to Bakersfield. Although agricultural areas are apparent on aerial photos, the agricultural analysis is unable to ascertain agricultural impacts along I-5 in Fresno County because the FMMP has not recorded farmland for this area due to insufficient soils data. I-80 travels through the agricultural areas of the northeastern portion of the Central Valley. Like I-5, SR-99 runs through agricultural lands for the majority of its length, with minor exceptions near Fresno. SR-152 runs through areas of agriculture from I-5 to SR-99. However, agricultural uses along the Central Valley portion of SR-152 are somewhat interrupted in the area of Los Banos due to the presence of slough and pond areas. Under the Modal Alternative, the Sacramento to Bakersfield region would also include runway-related improvements to the Sacramento International Airport that would consist of lengthening Runways 1 and 2. These runways are adjacent to FMMP-listed farmland—primarily farmland of statewide importance—and some prime farmland.

High-Speed Train Alternative: Alignment options run primarily north-northwest to south-southeast adjacent to existing Union Pacific Railroad (UPRR) or Burlington Northern Santa Fe (BNSF) rail rights-of-way. There is more farmland along the BNSF corridor in this region than along the UPRR corridor. These corridors are compared below.

- Sacramento to Merced. The HST alignment options along the existing BNSF mainline corridor between Sacramento and Merced would be located within the existing Central California Traction (CCT) right-of-way from Sacramento to north of Stockton, on new alignment north of and through Stockton, and would be developed adjacent to the existing BNSF right-of-way between Stockton and Merced. The existing BNSF corridor along this length generally travels through farmland areas on exclusive right of way, circumventing the urban areas. The HST alignment options along the existing UPRR corridor are adjacent to the existing UPRR right-of-way, and would travel through more urban areas than the alignment options along the BNSF corridor. The potential alignment would include a downtown station site within Stockton. However, high-speed service through Stockton's urban area would not be feasible. The existing tracks through Stockton would need to be improved to serve stopping trains, and express tracks bypassing Stockton's urban areas would need to be developed to facilitate high-speed travel around the Stockton area. These express tracks would traverse farmland areas. The potential Modesto express loop/bypass on the UPRR mainline would run on a new alignment that would pass through farmland areas.
- Merced to Fresno. HST alignment options along the existing BNSF corridor between Merced and Fresno would travel through more agricultural areas than the alignment options along the UPRR mainline. One of the alignment options along the BNSF corridor would include new potential alignments connecting to the UPRR corridor through downtown Fresno, which corresponds to the current rail consolidation plans in this area. The new alignment of the Merced bypass, on the BNSF corridor, would travel through farmland. The Merced bypass would traverse more farmland than would the portion of the BNSF corridor that it would bypass. Options have been defined for the Merced Station on the BNSF corridor or the Merced loop/bypass. The HST potential alignment options along the existing UPRR corridor would traverse more urban areas than those on the BNSF corridor.
- Fresno to Bakersfield. HST alignment options along the existing BNSF corridor between Fresno and Bakersfield would run on new alignments in the areas around Fresno, Hanford, and just north of Bakersfield, but would be developed adjacent to existing right-of-way for the majority of the segments between these cities. An express loop/bypass along with the mainline alignment would be required around Hanford due to the existing tight curves in the area. HST alignments along the existing UPRR corridor would travel through roughly the same amount of farmland as those along the BNSF corridor. The Fresno bypass would require the development of a new alignment through farmland on the outskirts of Fresno and would run through more farmland than the existing BNSF and UPRR corridors. (The existing BNSF and UPRR corridors travel through the urban area in Fresno.)

Bakersfield to Los Angeles

This region of southern California encompasses the southern portion of the Central Valley south of Bakersfield, the mountainous areas between the Central Valley and the Los Angeles basin, and the northern portion of the Los Angeles basin from Sylmar to downtown Los Angeles. FMMP-listed agricultural land in the region is located mainly around the Bakersfield area and is largely prime farmland and farmland of statewide importance.

Modal Alternative: The existing roadways relevant to the Modal Alternative in this region are I-5, SR-99, and SR-58. I-5 travels through the agricultural areas at points south and west of Bakersfield. These areas are not included in the FMMP database and are thus not included within this agricultural analysis. South of Bakersfield, where SR-99 merges with I-5, lay the foothills of the mountains south of the Central Valley, with fewer agricultural uses. Similar to I-5, SR-99 runs through agricultural lands south of Bakersfield. SR-58 travels through the agricultural areas south and east of Bakersfield.

High-Speed Train Alternative: The Bakersfield to Los Angeles region represents the transition from high agricultural use areas to urban areas. There is less agricultural land acreage within this area than in the Sacramento to Bakersfield region. From Bakersfield south there are two potential alignment options entering the Los Angeles area. The westernmost alignment would traverse the eastern portion of the Tehachapi Mountains, but would encounter farmland areas south of Bakersfield. The easternmost alignment would progress into the Palmdale/Lancaster area and would encounter less farmland as it travels east out of Bakersfield. Within the Los Angeles area, these alignments would join in the Sylmar area.

Los Angeles to San Diego via Inland Empire

This region of southern California includes the eastern portion of the Los Angeles basin from downtown Los Angeles east to the Riverside and San Bernardino areas and south to San Diego generally along the I-215 and I-15 corridors. FMMP-listed farmland in the region is located mainly between Lake Elsinore and Escondido, and is largely farmland of local importance and, to a lesser extent, unique farmland.

Modal Alternative: The existing roadways relevant to the Modal Alternative in this region are I-15 and I-215. I-15 travels through the agricultural areas south of Lake Elsinore, continuing to Escondido. I-215 travels through fewer agricultural areas west of Lake Perris. Also under the Modal Alternative, the Los Angeles to San Diego inland region would include runway-related improvements to the Ontario International Airport that would consist of adding a third runway. The existing runways are adjacent to FMMP-listed prime farmland.

High-Speed Train Alternative: The proposed alignment and station options in this region would progress eastward out of Los Angeles to San Bernardino and would then continue south to San Diego, encountering most of the regional farmland areas between Lake Elsinore and Escondido.

Los Angeles to San Diego via Orange County

This region includes the western portion of the Los Angeles basin between downtown Los Angeles and Los Angeles International Airport (LAX) and the areas of southern California between Los Angeles and Irvine, generally following the existing Los Angeles to San Diego via Orange County I-5 highway corridor. There is relatively little FMMP-listed agricultural land in the coastal region, and it is located between Santa Ana and Irvine. The farmland between Santa Ana and Irvine is mostly prime farmland, with a smaller area of unique farmland.

Modal Alternative: The existing roadway relevant to the Modal Alternative in this region is I-5, which travels through the agricultural areas south of Santa Ana, continuing to San Diego. FMMP-listed agricultural land along the I-5 is limited and is located between Santa Ana and Irvine, and around Oceanside. The farmland along I-5 between Santa Ana and Irvine is mostly prime farmland, with a smaller area of unique farmland. The farmland along I-5 near Oceanside is entirely farmland of local importance.

High-Speed Train Alternative: Alignment options in the LOSSAN region would primarily run through the south portion of Los Angeles County and along the central areas of Orange County. An alignment would also run from the central Los Angeles area to LAX. Considering the high urbanization of Los Angeles County and the Southern California region, very limited areas of farmland are present. The agricultural areas along the Los Angeles to Orange County alignments are primarily between Santa Ana and Irvine.

3.8.3 Environmental Consequences

A. EXISTING CONDITIONS COMPARED TO NO PROJECT ALTERNATIVE

The existing condition represents the No Project Alternative in the present and assumes the present transportation infrastructure is, and would continue to be, operational. As indicated earlier, California is presently losing farmland at a rate of 49,700 ac (20,100 ha) annually. This loss is primarily due to urban development fueled by a number of factors, including population growth, housing prices and economics, and commuting patterns (Kuminoff, Sokolow, and Sumner 2001). These circumstances suggest that there would be fewer farmland and agricultural resource areas in the future baseline case.

The No Project Alternative assumes that additional transportation improvements unrelated to this project would be programmed, funded, and expected to be operational by 2020. Some of the potential impacts on farmland from these projects would be mitigated. The trend of agricultural land conversion to accommodate urban development is likely to continue. Based on the present rate of farmland loss within the state, upon full implementation of the No Project Alternative by 2020, it is anticipated that the state would have lost nearly an additional 845,000 ac (342,000 ha) of farmland to urban development. This would represent a loss of approximately 3% of the state's 27 million ac (11 million ha) of farmland. The transportation improvements under the No Project Alternative would contribute to less than 1% of the 845,000-ac (342,000-ha) loss, but precise estimates are not possible.

B. NO PROJECT ALTERNATIVE COMPARED TO MODAL AND HIGH-SPEED TRAIN ALTERNATIVES

The No Project Alternative primarily represents planned highway improvements, with relatively minor infrastructure development. Although some farmland acquisition and conversion would likely occur under the No Project Alternative, it would be less than under the Modal or HST Alternatives because projects included in the No Project Alternative are primarily programmatic and do not require use of farmland. Table 3.8-1 provides the quantified potential impact amounts per region for the Modal and HST Alternatives.

The Modal Alternative would not create additional alignments but would expand existing infrastructure. There are various alignment options for the HST Alternative in each region.

Table 3.8-1
Impacts on Potential System-wide Agricultural Land by Alternative[a,b,c]

Alternative	Region	Prime Farmland in ac (ha)	Unique Farmland in ac (ha)	Statewide Importance in ac (ha)	Local Importance in ac (ha)	Region Totals in ac (ha)
Modal Alternative	Bay Area to Merced	168 (68)	31 (13)	56 (23)	7 (3)	262 (106)
	Sacramento to Bakersfield	323 (131)	54 (22)	181 (73)	51 (21)	609 (246)
	Bakersfield to Los Angeles	1 (0.4)	0	1 (0.4)	0	2 (0.8)
	Los Angeles to San Diego via Inland Empire	106 (43)	1 (0.4)	3 (1)	107 (43)	217 (88)
	Los Angeles to San Diego via Orange County[1]	15 (6)	4 (2)	1 (0.4)	8 (3)	28 (11)
Modal Alternative System-Wide Totals		**613 (248)**	**90 (36)**	**242 (98)**	**173 (70)**	**1,118 (452)**
HST Alternative (SWLPI)[c]	Bay Area to Merced	244 (99)	46 (19)	248 (100)	11 (4)	549 (222)
	Sacramento to Bakersfield	1,132 (458)	110 (45)	524 (212)	106 (43)	1,872 (758)
	Bakersfield to Los Angeles	0	0	0	0	0
	Los Angeles to San Diego via Inland Empire	7 (3)	0	0	17 (7)	24 (10)
	Los Angeles to Orange County	0	0	0	0	0
HST Alternative (SWLPI)[c] Totals		**1,383 (560)**	**156 (63)**	**772 (312)**	**134 (54)**	**2,445 (989)**
HST Alternative (SWGPI)[c]	Bay Area to Merced	305 (123)	175 (71)	207 (84)	83 (34)	770 (312)
	Sacramento to Bakersfield	1,532 (620)	370 (150)	868 (351)	232 (94)	3,002 (1,215)
	Bakersfield to Los Angeles	62 (25)	0	1 (0.4)	0	63 (25)
	Los Angeles to San Diego via Inland Empire	8 (3)	0	1 (0.40)	16 (7)	25 (10)
	Los Angeles to Orange County	0	0	0	0	0
HST Alternative (SWGPI)[c] Totals		**1,907 (772)**	**545 (221)**	**1,077 (436)**	**331 (134)**	**3,860 (1,562)**

[1] Modal extends to San Diego along I-5 since majority of Los Angeles to San Diego auto travel would take this route as opposed to I-215/I-15.

[a] Alternative's system-wide totals for all agricultural categories shown in bold.
[b] The SWLPI and SWGPI potential impacts are based on the conservative assumption that the HST study area for agricultural lands would be 100 ft (30 m) wide in rural areas adjacent to existing rail rights-of-way. The 100-ft (30-m) width may be reduced to 50 ft (15 m) in areas of high agricultural impact, and may further be reduced to near negligible levels should right-of-way agreements be made with the existing rail operators.
[c] The HST Alternative system-wide alignment combinations with the lowest potential impact are denoted as SWLPI. The HST Alternative system-wide alignment combinations with the greatest potential impact are denoted as SWGPI. The amounts were determined by separately adding the impact amounts of the LPI and GPI alignment combinations per region for all five regions. This was done for each FMMP category.

The results of the comparative analysis, including each of the FMMP-listed farmland categories as well as the regional category totals for each of the alternatives, support the following conclusions.

- The Modal and HST Alternatives each would result in potentially greater impacts on farmland than the No Project Alternative, with the highest potential impacts being attributable to the proposed HST Alternative system-wide alignment combinations with the greatest potential impact (SWGPI).
- Compared to the Modal Alternative, the HST Alternative would result in potentially greater impacts on farmland in two out of five regions (Sacramento to Bakersfield and Bay Area to Merced), similar impacts in one region (Bakersfield to Los Angeles), and fewer impacts in two regions (Los Angeles to San Diego via Inland Empire and LOSSAN).
- The regions with the greatest potential impacts on farmland and agricultural lands are the Bay Area to Merced and Sacramento to Bakersfield regions.
- The HST Alternative system-wide alignment combinations with the lowest potential impacts on farmland (SWLPI) would exceed the potential impacts on farmland resulting from the No Project and Modal Alternatives by 2,445 ac and 1,327 ac (989 ha and 537 ha), respectively.
- The HST Alternative SWGPI would exceed the No Project and Modal Alternatives by 3,860 ac and 2,742 ac (1,562 ha and 1,110 ha), respectively.
- The HST Alternative SWLPI could generate fewer impacts than the Modal Alternative within the farmland of local importance FMMP category.
- The HST right-of-way width could potentially be reduced to 50 ft (15 m) in the areas of impact. This reduction would reduce the HST level of impact and reduce potential differences in impacts between the HST and Modal Alternatives. The HST alignment options could fit into existing rail rights-of-way in constrained areas if agreements could be reached with existing owners/operators. This approach would reduce the potential impacts of the HST Alternative on farmland in these areas to a nearly negligible level.
- Compared to the state's potential total or overall farmland loss of nearly 845,000 ac (342,000 ha) by 2020, the Modal, HST SWLPI, and HST SWGPI Alternatives would each represent less than 0.4% of the total potential farmland loss.
- For the HST Alternative, loops/bypasses and connections on new alignments would represent greater potential impacts on farmland due to severance than the alignment options within or adjacent to existing rail rights-of-way.

3.8.4 Comparison of Alternatives by Region

Table 3.8-1 above provides a synoptic comparison of the Modal and HST Alternatives, including range (LPI and GPI) of potential impact depending on the HST alignment combinations per region and system-wide. The key findings of the agricultural lands analysis by region for the Modal Alternative and HST

Alternative alignment options are summarized below. Appendix 3.8-A provides tables that illustrate the amount of potential impacts associated with each HST alignment option by region.

A. BAY AREA TO MERCED

This region has the second highest concentration of farmland of the regions being studied. The HST Alternative (LPI and GPI) would have potentially higher impacts in all FMMP categories than the Modal Alternative. The total FMMP category acreage potentially impacted in this region would be 262 ac (106 ha) for the Modal Alternative, 549 ac (222 ha) for the HST Alternative LPI, and 770 ac (312 ha) for the HST Alternative GPI, thus indicating that the HST Alternative (LPI and GPI) would exceed the potential impact of the Modal Alternative by 287 ac and 508 ac (116 ac and 206 ha), respectively. This would be added to impacts that may result from the No Project Alternative by 2020. Figures 3.8-6 and 3.8-7 show the locations of the Modal Alternative improvements and HST Alternative in the region.

<u>Modal Alternative</u>

Nearly all of the improvements under the Modal Alternative would be in areas containing existing roadway rights-of-way and runways. The agricultural impacts analysis included a review of existing roadways that could accommodate the development of one lane each way in the center median. The ability to add lanes to the center median reduces the requirement to acquire farmland for outside lane expansion, and thus reduces potential farmland impacts. The Modal Alternative improvements would be implemented on existing roadways in this region; no farmland parcels would be severed.

The roadways relevant to the Modal Alternative in this region are I-80, I-580, I-880, US-101, and SR-152. Considering the location of FMMP-listed farmland in this region and the ability to develop lanes in the center medians of the above-mentioned roadways, the areas of greatest potential impact would be primarily along SR-152 east of I-5, and secondarily along US-101 in the Santa Clara Valley. Possible roadway improvements in these areas could result in farmland impacts because they would require the acquisition of farmland adjacent to the roadway due to their apparent inability to accommodate the development of inside lanes.

The amount of farmland potentially impacted in the Bay Area to Merced region for the Modal Alternative would be 168 ac (68 ha) of prime farmland, 31 ac (13 ha) of unique farmland, 56 ac (23 ha) of farmland of statewide importance, and 7 ac (3 ha) of farmland of local importance. The Modal Alternative would potentially impact a total of 262 ac (106 ha) of farmland in this region.

<u>High-Speed Train Alternative</u>

This region includes potential alignment options that could extend southward from either San Francisco or Oakland to San Jose or Gilroy, and on to Merced. Farmland in this region is primarily in the east along the west margin of the Central Valley, and secondarily between San Jose and Gilroy. Farmlands are sparsely located in the San Francisco and Oakland urban areas.

The HST Alternative may benefit from being able to use existing rail rights-of-way. Configuration options of the HST Alternative, as indicated in the methodology subsection, include developing the HST alignment options within or adjacent to existing rail rights-of-way, or on new alignments. The development of the HST alignment options within or adjacent to existing rail rights-of-way would reduce the potential for farmland impacts from conversion, and significantly reduce severance-related farmland impacts. Both the Modal and HST Alternatives have this potential to reduce impacts on farmland.

High-Speed Train Alignment Option Comparison

Very little farmland is found in the San Francisco and Oakland urban areas. The Diablo Range direct and Pacheco Pass alignment options would connect the Bay Area to the Merced area. The Diablo Range direct alignment option would result in less potential for farmland impacts because it would travel through urban and mountainous areas and would not extend as far east into the Central Valley farmland areas as the Pacheco Pass.

There are two options for the potential Pacheco Pass alignment through the Gilroy area: through downtown Gilroy (Caltrain/Gilroy/Pacheco Pass) and bypassing Gilroy to the north (Morgan Hill/Caltrain/Pacheco Pass). The Morgan Hill/Caltrain/Pacheco Pass alignment option would result in potential impacts on 26 ac (11 ha) of farmland more than the Gilroy/Caltrain/Pacheco Pass alignment option. This greater impact would be due primarily to the Gilroy/Caltrain/Pacheco Pass option being closer to suburban areas with fewer adjacent agricultural uses than the more agricultural areas of the Morgan Hill/Caltrain/Pacheco Pass. The LPI alignment combination in this region would use the Caltrain alignment from San Francisco to San Jose and the Diablo Range direct Northern Tunnel option from San Jose to Merced, potentially impacting a total of 549 ac (222 ha) of farmland. All of the 549 ac (222 ha) impacted would be located in the western part of the Central Valley at the east end of this alignment.

The GPI alignment combination in this region would use the Hayward/I-880 alignment from Oakland to San Jose and the Morgan Hill/Caltrain/Pacheco Pass alignment from San Jose to Merced. This alignment combination would potentially result in impacts on 770 ac (312 ha) of total farmland, which is approximately 221 ac (89 ha) more than the LPI alignment combination. Approximately 629 of the 770 ac (255 of the 312 ha) would be attributable to the farmland located in the western part of the Central Valley at the east end of this alignment which is mostly an agricultural area. See Appendix 3.8-A for potential impacts associated with each HST alignment option in all regions.

B. SACRAMENTO TO BAKERSFIELD

The Central Valley represents the most active agricultural region in California. Potential improvements to highways and airports, as well as new HST alignments and stations in the Sacramento to Bakersfield region, would generate the greatest potential for impacts on farmland of the regions analyzed. The HST Alternative (LPI and GPI) would have higher impacts in all FMMP categories than the Modal Alternative. The total FMMP category acreage potentially impacted in this region would be 609 ac (246 ha) for the Modal Alternative, 1,872 ac (758 ha) for the HST Alternative LPI, and 3,002 ac (1,215 ha) for the HST Alternative GPI, thus indicating that the HST Alternative LPI and GPI would exceed the potential impact of the Modal Alternative by 1,263 ac and 2,393 ac (511 ha and 968 ha), respectively. Figures 3.8-8A and 3.8-8B and 3.8-9A and 3.8-9B show the locations of the Modal Alternative and HST Alternative improvements in the region.

Modal Alternative

As with the Bay Area to Merced region, areas along existing roadways in the Sacramento to Bakersfield region that can accommodate an additional lane in each direction within the center median were assumed not to generate farmland impacts because acquisition and conversion of adjacent agricultural lands would not be required. Under this assumption, the number of acres of farmland impacted by roadway right-of-way acquisition for the Modal Alternative would be 287 ac (116 ha) of prime farmland, 43 ac (17 ha) of unique farmland, 124 ac (50 ha) of farmland of statewide importance, and 48 ac (19 ha) of farmland of local importance. Total roadway-related impacts on farmland under the Modal Alternative would be 502 ac (203 ha).

Airport-related improvements under this alternative would include the lengthening of Runways 1 and 2 at the Sacramento International Airport. These improvements would potentially impact

36 ac (15 ha) of prime farmland, 11 ac (4 ha) of unique farmland, 57 ac (23 ha) of farmland of statewide importance, and 3 ac (1 ha) of farmland of local importance. Total potential airport-related impacts on farmland under the Modal Alternative would be 107 ac (43 ha).

Collectively, the Modal Alternative improvements, roadway and airport, would potentially impact 323 ac (131 ha) of prime farmland, 54 ac (22 ha) of unique farmland, 181 ac (73 ha) of farmland of statewide importance, and 51 ac (21 ha) of farmland of local importance. The Modal Alternative would potentially impact a total of 609 ac (246 ha) of farmland in this region.

High-Speed Train Alternative

It is generally assumed that potential HST alignments in the Sacramento to Bakersfield region would be developed adjacent to existing UPRR or BNSF rail rights-of-way. In some segments, however, the alignment options are assumed to be within existing rights-of-way (e.g., CCT from Sacramento to Stockton). The GIS analyses accounted for these alignment areas. Some alignment options within the Sacramento to Bakersfield region, particularly the express loops/bypasses and connections between existing corridors would require new alignments separate from existing rail corridors.

Farmland severance impacts (i.e., impacts from dividing parcels currently in agricultural use) would potentially result, in addition to farmland conversion. While the precise amount of farmland potentially severed by the HST alignment options cannot be ascertained at this level of study, the HST alignment options on new alignments traversing farmland areas would have the potential to sever the vast majority of parcels traversed due to the curving nature of the alignments.[2]

High-Speed Train Alternative Alignment Option Comparison

The area of highest potential impact in this region would be Stockton, followed by Fresno and the north portion of Bakersfield. Although there could potentially be alignments on new corridors in the Merced area, these alignments would not occur in farmland areas. The Sacramento to Bakersfield region also has several potential express loops/bypasses under consideration that are intended to circumvent the more congested urban areas, reduce costs, and reduce potential urban impacts such as noise. They are generally routed through the agricultural areas surrounding the urban areas, resulting in greater farmland conversion and severance-related impacts.

As shown below in Table 3.8-2, seven of the eight potential express loops in the region would have higher potential farmland impacts than the mainline alignments that they would bypass. Although express loops are shown separately, some areas may require the development of an express loop and mainline alignment. Such instances have been accounted for in this report's LPI and GPI alignment combinations analysis.

[2] Severance issues may arise in the Sacramento to Bakersfield region where the HST alignment options would bypass urban areas on new corridors traveling primarily north-northwest to south-southeast, and result in diagonally dividing a number of north-south oriented farmland parcels.

Table 3.8-2
Potential Farmland Impacts: Express Loops Compared to Mainlines

Alignment	Express Loop	Prime Farmland in ac (ha)	Unique Farmland in ac (ha)	Statewide Importance in ac (ha)	Local Importance in ac (ha)	Total Farmland in ac (ha)
Stockton to Modesto	Modesto loop	141 (57)	0	0	0	141 (57)
	Mainline	49 (20)	0	0	0	49 (20)
Modesto to Merced	Atwater Station loop	79 (32)	0	2 (0.8)	3 (1)	84 (34)
	Mainline	52 (21)	0	2 (0.8)	23 (9)	77 (31)
	Merced loop (BNSF)	45 (18)	9 (4)	72 (29)	5 (2)	131 (53)
	Mainline	35 (14)	1 (0.4)	23 (9)	7 (3)	66 (27)
	Merced loop (UPRR)	40 (16)	10 (4)	72 (29)	5 (2)	127 (51)
	Mainline	48 (19)	3 (1)	20 (8)	6 (2)	77 (31)
Merced to Fresno	Fresno loop (BNSF)	149 (60)	76 (31)	63 (26)	5 (2)	293 (119)
	Mainline	70 (28)	23 (9)	32 (13)	9 (4)	134 (54)
	Fresno loop (UPRR)	131 (53)	44 (18)	42 (17)	7 (3)	224 (91)
	Mainline	3 (1)	0	11 (5)	1 (0.4)	15 (6)
Fresno to Tulare	Hanford Station loop	46 (19)	0	15 (6)	0	61 (25)
	Mainline	74 (30)	0	13 (5)	0	87 (35)
Tulare to Bakersfield	Tulare loop	103 (42)	3 (1)	12 (5)	1 (0.4)	119 (48)
	Mainline	60 (24)	2 (1)	13 (5)	0	75 (30)

Although more potential farmland conversion-related impacts would occur along the alignments of the proposed express loops than along the urban areas they would bypass, there would be the potential for severance-related impacts. These impacts are likely to occur as a result of the curvilinear nature and diagonal directions of travel of the express loops as compared to the more north-south orientation of the farmland parcels. For instance, a curved alignment through farmland has more potential to sever farmland than a straight alignment located along a road section or other linear feature.

Based on GIS analysis included in the related *System-Wide Agricultural Resources and Farmlands Report* (Parsons Brinkerhoff 2003), there would be consistently less agricultural land potentially impacted by the alignment options adjacent to the UPRR corridor than the BNSF corridor. Map observations and review of aerial photography reveal that the UPRR corridor runs parallel to SR-99. Much of the urban growth in the last 50 years in the Central Valley appears to have been around SR-99 (California Department of Transportation 2003). The nearby UPRR corridor would be in urban areas with correspondingly fewer agricultural severances or conversions. Potential HST alignment options adjacent to these corridors or sharing them would generate similar impacts on farmland. See Appendix 3.8-A for potential impacts associated with each HST alignment option in all regions.

C. BAKERSFIELD TO LOS ANGELES

The Bakersfield to Los Angeles region represents the transition from agricultural areas in the Central Valley to urbanized areas of Los Angeles. For the HST Alternative, the HST Alternative GPI would have the highest potential impacts in all FMMP categories (63 ac [25 ha]); the Modal Alternative and the HST Alternative LPI would have similar levels of impact, 2 ac (0.8) and 0 ac, respectively. Figures 3.8-10 and 3.8-11 show the locations of the Modal Alternative and HST Alternative improvements for the region.

Modal Alternative

Little farmland would be traversed by the potential Modal Alternative improvements in this region. The portions of the existing roadways that are able to accommodate an additional lane in each direction in the center median were assumed not to generate additional/new farmland impacts. The amount of farmland potentially impacted by the Modal Alternative in the region would be 1 ac (0.4 ha) of prime farmland and 1 ac (0.4 ha) of farmland of statewide importance. Based on these assumptions, the Modal Alternative would potentially impact a total of 2 ac (1 ha) of farmland in this region.

High-Speed Train Alternative

The FMMP database indicates that land uses along the Sylmar to Los Angeles alignment are all considered urban. Most of the farmland and agricultural resources in the region are south and east of the outskirts of Bakersfield. Little farmland would be traversed by the proposed HST Alternative alignment options in this region; there is virtually no farmland in the FMMP categories in the region.

High-Speed Train Alternative Alignment Option Comparison

The I-5 Union Avenue and Wheeler Ridge Road alignment options would traverse more farmland and thus would have the greatest potential impacts (63 ac [25 ha]) among the proposed HST alignment options. The LPI alignment combination would be the SR-58/Soledad Canyon alignment along the Bakersfield to Sylmar segment, and either the MTA/Metrolink or combined I-5/Metrolink portion along the Sylmar to Los Angeles segment. With implementation of this alignment combination, no farmland impacts would occur. The GPI alignment combination would be the Wheeler Ridge to I-5 alignment along the Bakersfield to Sylmar segment, and either the MTA/Metrolink or combined I-5/Metroliink portions along the Sylmar to Los Angeles segment. With implementation of this alignment combination, impacts on 63 ac (25 ha) of farmland would occur. See Appendix 3.8-A for potential impacts associated with each HST alignment option in all regions.

D. LOS ANGELES TO SAN DIEGO VIA INLAND EMPIRE

The Los Angeles to San Diego via Inland Empire region includes farmland areas located mainly along I-15 between Riverside and south of Escondido. The Modal Alternative would have more potential impacts in all FMMP categories than the HST Alternative LPI and GPI. The total FMMP category acreage potentially impacted in this region would be 217 ac (88 ha) for the Modal Alternative, 24 ac (10 ha) for the HST Alternative LPI, and 25 ac (10 ha) for the HST Alternative GPI, thus indicating that the Modal Alternative would exceed the potential impact of the HST Alternative LPI and GPI by 193 ac and 192 ac (78 ha), respectively. Figures 3.8-12 and 3.8-13 show the potential impacts of the Modal Alternative and HST Alternative in this region.

Modal Alternative

There is not space available to add lanes to the center medians of I-15 and I-215; thus additional right-of-way would be required in this region. The amount of farmland impacted by possible Modal Alternative roadway right-of-way acquisition would be 25 ac (10 ha) of prime farmland, 1 ac (0.4 ha) of unique farmland, 3 ac (1 ha) of farmland of statewide importance, and 107 ac (43 ha) of farmland of local importance. Total potential roadway-related impacts on farmland under the Modal Alternative would be 136 ac (55 ha).

Airport-related improvements under this alternative would include the addition of a third runway at the Ontario International Airport. Total potential airport-related impacts on farmland under the Modal Alternative would be 81 ac (33 ha), all of which would be prime farmland.

Collectively, the Modal Alternative improvements would potentially impact 106 ac (43 ha) of prime farmland, 1 ac (0.4 ha) of unique farmland, 3 ac (1 ha) of farmland of statewide importance, and 107 ac (43 ha) of farmland of local importance. The Modal Alternative would potentially impact a total of 217 ac (88 ha) of farmland in this region.

High-Speed Train Alternative

The Los Angeles to San Diego via Inland Empire region would travel eastward out of Los Angeles to San Bernardino and would then continue south from San Bernardino to San Diego. Most of the region's farmland and agricultural resource areas are located between Lake Elsinore and Escondido, and portions of the farmland would potentially be impacted by the HST alignment options.

The LPI alignment combination would be the UPRR Colton Line alignment or UPRR Riverside/UPRR Colton Line alignment from the Los Angeles to March Air Reserve Base (ARB) segment to the San Jacinto to I-15 alignment, from the March ARB to Mira Mesa segment to any of the alignments in the Mira Mesa to San Diego segment. With implementation of this alignment combination, impacts on 24 ac (10 ha) of farmland would occur.

The GPI alignment combination would be the UPRR Colton Line to San Bernardino alignment from the Los Angeles to March ARB segment to the San Jacinto to I-15 Alignment, from the March Air Force Base to Mira Mesa segment to any of the alignments in the Mira Mesa to San Diego segment. With implementation of this alignment combination, impacts on 25 ac (10 ha) of farmland would occur. See Appendix 3.8-A for potential impacts associated with each HST alignment option in all regions.

E. LOS ANGELES TO SAN DIEGO VIA ORANGE COUNTY

The Los Angeles to San Diego via Orange County region includes only limited farmland areas located between Santa Ana and Irvine and near Oceanside for the Modal Alternative. The Modal Alternative would have greater potential impacts in all FMMP categories than the HST Alternative LPI and GPI in this region. The total FMMP category acreage potentially impacted in this region would be 28 ac (11 ha) for the Modal Alternative, 0 ac for the HST Alternative LPI, and 0 ac for the HST Alternative GPI. Thus, the Modal Alternative would exceed the potential impact of the HST Alternative LPI and GPI by 28 ac (11 ha). Figures 3.8-14 and 3.8-15 show the locations of the Modal Alternative and HST Alternative improvements for the region.

Modal Alternative

FMMP-listed agricultural land in the coastal region, located between Santa Ana and Irvine and around Oceanside, is sparse. The farmland between Santa Ana and Irvine is mostly prime farmland, with a smaller area of unique farmland. The farmland around Oceanside is entirely farmland of local importance. Under the Modal Alternative, one northbound and one southbound lane would be added to I-5. However, I-5 in this region lacks sufficient width for additional lanes in the center median. Right-of-way would need to be acquired to develop added outside lanes. The amount of farmland the Modal Alternative would potentially impact in the LOSSAN region would be 15 ac (6 ha) of prime farmland, 4 ac (2 ha) of unique farmland, 1 ac (0.4 ha) of farmland of statewide importance, and 8 ac (3 ha) of farmland of local importance. The Modal Alternative would impact a total of 28 ac (11 ha) of farmland in this region.

High-Speed Train Alternative

The Los Angeles to Orange County coastal region runs primarily along the southern California coastal areas through Los Angeles and Orange County. This region includes alignment options from central Los Angeles to LAX, and from the central Los Angeles area to Irvine. The existing UPRR Santa Ana Branch would be an HST alignment option. The existing LOSSAN alignment from Los Angeles to Irvine is being considered for shared HST and conventional passenger train service. The HST alignment options that would be developed primarily within the existing LOSSAN corridor right-of-way and no farmland resources would be impacted.

High-Speed Train Alternative Alignment Option Comparison

The HST alignment options that would be developed in the existing LOSSAN corridor right-of-way would only require development of bypasses; no farmland resources would be impacted. See Appendix 3.8-A for potential impacts associated with each HST alignment option in all regions.

3.8.5 Design Practices

The Authority is committed to utilizing existing transportation corridors and rail lines in the proposed high-speed rail system in order to minimize the need to encroach onto additional agricultural lands. Nearly 70% percent of the preferred HST Alternative is either within or adjacent to a major existing transportation corridor (existing railroad or highway right-of-way). These existing transportation corridors, along which the HST system would be placed, have already divided properties and agricultural lands. Moreover, portions of the alignment would be on aerial structure or in tunnel, allowing for vehicular or pedestrian access across the alignment. Only 24% percent of the preferred HST overall preferred alignment would be in new at-grade rail corridors (not on aerial structure and not in tunnel) and not within or adjacent to an existing transportation right-of way), where there would be the potential to divide or sever properties. For the HST system, underpasses or overpasses would be constructed at reasonable intervals to provide property access, and/or appropriate severance payments would be made to the property owners whose land is severed. The Authority would work directly with land owners during the final design of the system regarding the location(s) for access passages (overpasses or underpasses) to enable adequate property access.

To minimize the potential impact to agricultural lands, the HST right-of-way width could potentially be reduced to 50 ft (15 m) in constrained areas. In addition, the Authority is committed to pursuing agreements with existing owners/rail operators to place the HST alignment within existing rail rights-of-way, which would avoid and /or minimize potential impacts to agricultural resources.

3.8.6 CEQA Significance Conclusions and Mitigation Strategies

Based on the analysis above, and considering the CEQA Appendix G thresholds of significance for agricultural lands, the HST alternative would have a significant impact to agricultural lands when viewed on a system-wide basis. Some direct conversion of agricultural lands to other non-agricultural uses would be expected. The HST alternative may also result in changes such as the severance of agricultural parcels that could indirectly contribute to agricultural land conversion. At this programmatic level of analysis it is not possible to know precisely the location, extent, and particular characteristics of agricultural lands that would be involved, or the precise impacts on those lands. The impact is therefore considered significant. Mitigation strategies, as well as the design practices discussed in section 3.8.5, will be applied to reduce this impact.

Mitigation of potentially major impacts on farmland (i.e., by conversion to other uses) would be based first on avoidance. The strategy followed beginning early in the conceptual design stage of the project was to avoid farmland wherever feasible. Throughout the initial screening of alternatives, a number of potential alignment options were eliminated due to the high potential for farmland impacts as well as other impacts (i.e., potential new alignments in the foothills of the Central Valley). Where potential impacts on farmland would occur, the effort would focus on reducing the potential impact. Potential system-wide impacts have been reduced by sharing existing rail rights-of-way wherever feasible or by alignment immediately adjacent to them.

Site-specific impacts would need to be assessed and evaluated in project-level environmental review, and specific farmland mitigation measures would be considered, such as access modifications. Potential mitigation strategies would focus on securing easements, participation in mitigation banks, and local planning measures to increase the permanent protection of farmlands, open space and habitat lands.

The Authority would coordinate these efforts with other mitigation initiatives such as the California Farmland Conservancy Program (California Public Resources Code section 10222 et seq.), which is managed by the California Department of Conservation. This program provides grant funding for the purchase of agricultural easements and grants for farmland policy and planning projects. The Authority would review what this program is doing and the areas in which it has identified needs for farmland preservation. During project-level review where the co-lead agencies determine that farmland mitigation is required to address site-specific impacts from the HST system, one strategy may be to support easements that further this existing conservation program.

The Authority would coordinate with private agricultural land trusts, local programs, mitigation banks, and other agricultural stewardship programs to help identify needs for farmland protection.

The Authority would also coordinate with Resource Conservation Districts to identify additional measures to limit impacts to or otherwise to protect farmlands.

The feasibility of any mitigation strategy would have to be evaluated at the project-specific level and would depend on such factors as an assessment of the land under the state LESA model or other significance criteria, the number of voluntary participants in local or regional programs, and the cost of acquiring easements. Possible mitigation strategies for severance impacts could include alternative access, HST realignment, or over-crossings at select locations.

The Authority has established policies regarding the use of smart growth and transit oriented development strategies for station areas (see Chapter 6B), which will help to avoid secondary growth impacts on agricultural lands.

The above mitigation strategies are expected to substantially lessen or avoid impacts to agricultural lands in many circumstances. Sufficient information is not available at this programmatic level, however, to conclude with certainty that the above mitigation strategies will reduce impacts to agricultural lands to a less than significant level in all circumstances. This document therefore concludes that impacts to agricultural lands would remain significant, even with the application of mitigation strategies. Additional environmental assessment will allow a more precise evaluation in the second-tier project-level analysis.

3.8.7 Subsequent Analysis

As indicated earlier, the above analysis does not provide a parcel-specific potential impact analysis for farmland. Subsequent project-level analysis would address local issues once the potential alignments are defined in more detail, assuming a decision is made to proceed with the HST Alternative. Subsequent project-level environmental documentation would include more detailed information on potential severance impacts insofar as it potentially impacts a working landscape, and on potential impacts on FMMP-listed farmland, farmland under Williamson Act contracts, and farmland easements.

3.9 AESTHETICS AND VISUAL RESOURCES

Visual resources are the natural and human-made features of a landscape that characterize its form, line, texture, and color. This section describes the existing landscape in the five regions and identifies potential impacts on visual resources for each alternative related to the proposed addition of infrastructure in, or removal of infrastructure from, the existing landscape. Infrastructure may include roadway expansion, airport improvements, high-speed train (HST) improvements/construction, tunnels, fences, noise walls, elevated guideways, catenaries,[1] and stations. This assessment evaluates the potential changes to existing scenic landscapes for each alternative and HST alignment station option during construction (addition of construction staging areas, site work, construction equipment, temporary barriers, fences, and temporary power poles) and operation.

3.9.1 Regulatory Requirements and Methods of Evaluation

A. REGULATORY PROVISIONS

There are no specific regulatory requirements or federal or state standards for aesthetics and visual resources. However, there is a requirement in both federal and state environmental guidelines to address topics related to the visual environment. The most explicit guidance is in CEQA environmental checklist, which requires that a project proponent identify whether a project would have a substantial adverse effect on a scenic vista; substantially damage scenic resources, including trees, rock outcroppings, and historical buildings within a state scenic highway; substantially degrade the existing visual character or quality of the site and its surroundings; or create a new source of substantial light or glare that would adversely affect day or nighttime views in the area (CEQA Appendix G Environmental Checklist Form 2001). The Federal Rail Authority (FRA) Procedures for Considering Environmental Impacts (FRA Docket No EP-1, Notice 5, May 26, 1999), under the topic of aesthetic environmental and scenic resources, states: "The EIS should identify any significant changes likely to occur in the natural landscape and in the developed environment. The EIS should also discuss the consideration given to design quality, art, and architecture in project planning and development as required by DOT Order 5610.4." Consideration of local community design guidelines would be part of a subsequent phase of analysis for project-specific environmental review when more detailed engineering and architectural information would be developed for proposed alternatives. California Department of Transportation (Caltrans) design standards would apply to state highway improvements under the No Project and Modal Alternatives.

B. METHOD OF EVALUATION OF IMPACTS

The analysis of aesthetic and visual resources for this Program EIR/EIS focuses on a broad comparison of potential impacts on visual resources (particularly scenic resources, areas of historic interest, and natural open space areas and significant ecological areas [SEAs]) along proposed Modal and HST Alternative corridors and around HST stations. The potential impacts for each of these alternatives are evaluated against the existing conditions, as described in Section 3.9.2, *Affected Environment.*

Photo simulations have been prepared to illustrate the conceptual design of the facilities associated with the Modal and HST Alternatives for a set of typologies (or general descriptions) selected from each of the regions and representative of highly scenic landscapes most subject to potential significant visual impacts. These simulations have been used to evaluate how the distinguishable (dominant) visual features (color, line, texture, form) that characterize the existing landscape would change if the alternative were implemented. Of particular interest are locations where plans and profiles show elevated structures (guideways or overpasses), and tunnel portals or extensive cut or

[1] *Catenaries* are the wires and support-pole system that deliver the power supply to the proposed HST system.

fill. Also addressed in the evaluation is the potential shadow effect of elevated structures and the light and glare effects of the proposed alternatives. For the HST Alternative, the linear feature of the overhead electric wires and poles to supply power to the train, and the fenced track and potential noise barriers are considered in the evaluation.

Potential changes to the dominant landscape features, or potential visual impacts, are described and ranked as high, medium, or low according to the potential extent of change to existing visual resources. Visual contrast rankings, or impact rankings, are defined as follows.

- *High visual impacts* would be sustained if features of the alternative were obvious and began to dominate the landscape and detract from the existing landscape characteristics or scenic qualities.
- *Medium visual impacts* would be sustained if features of the alternative were readily discernable but did not dominate the landscape or detract from existing dominant features.
- *Low visual impacts* would be sustained if features of the alternative were consistent with the existing line, form, texture, and color of other elements in the landscape and did not stand out.
- *Shadow impact ranking* would be high if the new (not existing) elevated structure were within 75 feet (ft) (23 meters [m]) of residential or open space, natural areas, or parkland.
- *Beneficial visual impact* would result if the alternative eliminated a dominant feature in the landscape that currently detracts from scenic qualities or blocks vistas.

3.9.2 Affected Environment

A. STUDY AREA DEFINED

The study area for aesthetics and visual resources is defined as 0.25 mi (0.40 km) from the centerline of proposed alternative corridors and around stations and airports. However, where there are scenic viewing points or overlooks within 1 mi (2 km) of the alternative, these scenic viewing points have been included in the study area. The distance range of up to 0.25 mi (0.40 km) from proposed corridors and stations and up to 1 mi (2 km) from proposed alternative corridors and facilities for scenic viewing points is considered the area where a change in landscape features would be most noticeable to viewers, and where newly introduced features could begin to dominate the visual character of the landscape.

B. GENERAL DISCUSSION OF AESTHETICS AND VISUAL RESOURCES

Each of the five regions includes a number of distinct types of landscapes spread over a large geographic area, many of which are common among the regions. A typology of typical landscapes is used to describe the aesthetic and visual resources in the study area. The typologies provide the baseline or existing conditions against which the analysis of potential change or visual impact for each of the proposed alternatives is evaluated. Photographs of highly scenic and typical landscapes within each of the five regions are provided to illustrate the dominant line, form, color, and texture for that landscape typology.

The landscape typologies discussed are urban mixed use, urban suburban, traditional small urban community, industrial use, rural agriculture, rural desert, and natural open space and parks.

Urban Mixed Use

High-density urban mixed-use landscapes consist of multifamily housing, high-rise office buildings, at-grade and elevated transportation systems (Caltrain, BART, Metrolink, San Diego Trolley), street grids, and limited vegetation. This landscape characterizes the major metropolitan areas in the study area: San Francisco, Los Angeles, Sacramento, San Jose, and San Diego.

Urban Suburban

This typology consists of suburban areas of low-density development—modern single-family houses, yards set back, trees and ornamental landscaping—located around more densely developed metropolitan areas. This typology also includes commercial, retail, office structures, and infrastructure such as roads, highways, overpasses, underpasses, rail lines, and utilities. Examples include South San Jose, Irvine to Oceanside, San Bernardino, Riverside, and Merced.

Traditional Small Urban Community

This typology is characterized by long-established rural communities—older buildings and historic architecture two to three stories high, with mature street trees—along existing highways or rail corridors. This typology comprises historic or early post-World War II residential neighborhoods characterized by small- to mid-size houses on small lots with narrow streets, and retail, commercial, and institutional mixed uses along arterial streets. Examples include Morgan Hill, Gilroy, Visalia, Tulare, and Santa Clarita.

Industrial Use

This landscape typology features industrial complexes with structures and warehouses of widely varied areas, sizes, and scales, and includes freight tracks and rail yards, transmission towers, substations, and utility lines. This typology typically is found along existing rail corridors or major highways.

Rural Agricultural

Broad, open agricultural fields with or without fences, along with barns, silos, and other farm structures, farm equipment, isolated farm houses, and low-density rural commercial strips typify this typology. The horizontal topography is characterized by crop fields, farm roads, fence and pole lines, and wind breaks, punctuated by barns, houses, sheds, water towers, and other agriculture-related structures. This landscape is typical of the Central Valley region.

Rural Desert

In this typology, open, flat, barren land is dotted with desert plants and shrubs, and residential and commercial structures. This landscape typology is found south of Bakersfield in the Bakersfield to Los Angeles region, and in the Inland Empire region.

Natural Open Space and Parks

Undeveloped natural areas such as coastal lagoons, forested mountains, mountain lakes and streams, rolling hills with woodlands and grasslands, or forested ridges and valleys with lush vegetation form the dominant visual features of these landscapes. These landscapes are typically scenic with high aesthetic qualities. Examples include the Pacheco Pass/Diablo Range, Tehachapi Mountains, and coastal area from San Clemente to San Diego.

C. AESTHETICS AND VISUAL RESOURCES BY REGION

A geographic information systems (GIS) map showing the location of the scenic corridors (identified in regional and local planning documents as "corridors with landscapes of high scenic qualities and scenic vistas") and scenic or sensitive landscapes in the northern region is shown in Figure 3.9-1A and in Figure 3.9-1B for the southern region. For both the No Project and Modal Alternatives, the affected environment is divided into typologies along both sides of existing highway and rail corridors. Several of the HST alignment options being evaluated are either within or adjacent to these existing highway or rail corridors and therefore would potentially affect many of the same landscapes.

Bay Area to Merced

This region includes central California from the San Francisco Bay Area (San Francisco and Oakland) south to the Santa Clara Valley and east across the Diablo Range to the Central Valley. Landscape types vary substantially in this region, from primarily urban mixed use or urban industrial in the northern part of the Bay Area, to more rural and natural open space landscape in the southern part of the region. From San Jose to Gilroy, the study area includes about 20 mi (32 km) of scenic corridor along US-101. From Gilroy through the Diablo Mountain Range or through the Pacheco Pass (along SR-152) for about 35 mi (56 km), the study area consists of a mix of highly scenic agricultural, wetland, and natural open space landscapes, and the Henry W. Coe State Park backed by mountains (Mount Hamilton) and rolling hills with mixed oak woodlands and grasslands.

Starting from the northern part of the region, the landscapes along the Caltrain corridor and US-101 and I-880 between San Francisco and San Jose and along the Union Pacific Railroad (UPRR) corridor between Oakland and San Jose are typically urban mixed use or industrial, with stretches of urban suburban residential and commercial landscapes between the metropolitan destinations of San Francisco, Oakland, and San Jose. On the Oakland side of the Bay, the existing UPRR Line splits off to the Hayward Line and the Mulford Line. The Mulford Line traverses the eastern edge of the Don Edwards San Francisco Bay National Wildlife Refuge and transitions to the Niles Line that goes through the historic town of Niles near the mouth of the scenic Niles Canyon. The existing non-electric rail tracks and stations along the Caltrain corridor on the west side of the Bay and the UPRR tracks and elevated BART guideway on the east side of the Bay are dominant linear features in the landscape between Oakland/San Francisco and San Jose. Views of the Bay are part of the aesthetic landscape experience along the UPRR in the East Bay and also along some segments of Caltrain near the San Francisco International Airport (SFO). Views of the skyline of San Francisco are visible from the Caltrain alignment approaching the city. Views of the Caltrain tracks are visible from several local parks and from San Bruno Mountain hiking trails; however, the tracks are not a dominant visual feature in these landscapes (the multiple-lane freeways and bridges are dominant). The San Jose Diridon Station is a designated historic property listed on the National Register of Historic Places. The station dates to 1935, with architectural features characteristic of that period.

The traditional small urban community landscapes south of the highly urbanized San Jose area and through the small rural towns of Morgan Hill and Gilroy are characterized by mixed residential, commercial, and institutional uses in early to mid-20th-century contiguous buildings, average heights of two to three stories, minimal setbacks from streets, mature landscaping, and pedestrian-oriented streetscapes. Dominant visual features are historic architecture, mature street trees, and the surrounding distant mountainous ridgelines. Figure 3.9-2, *Gilroy Station*, shows traditional small urban community typology with historic rural community character.

The natural open space landscapes along SR-152 in Pacheco Creek Valley east of Gilroy are characterized by coastal mountains and mountain valley topography typified by rolling to steep-sloped grassland with shrubs, clusters of oaks and other native tree species, and wooded bottomland. Much of this area is part of the Henry Coe State Park and Mount Hamilton Project Area of The Nature Conservancy (described in Section 3.15, *Biological Resources and Wetlands*) that is designed to preserve the rich natural habitats in a 780-sq-mi (1255-sq-km) area of the Diablo Range. Small farms or ranches (in bottomlands), isolated roadside businesses, and widely dispersed small communities (e.g., Casa de Fruta) characterize the landscape. Figure 3.9-3, *Pacheco Pass*, illustrates a rural agricultural and natural open space landscape typology.

The coastal valley landscape consists of flat or rolling landscapes ringed with low hills and mountains in the background. Dominant visual elements are vistas of agricultural bottomland and wetlands framed by background views of green hills, ridges, and mountains. East of the community of San Felipe, the coastal valley landscape transitions into the rural agricultural landscape typical of the Central Valley.

Sacramento to Bakersfield

This region of central California includes a large portion of the Central Valley (San Joaquin Valley) from Sacramento south to Bakersfield. At the northern end of the region in the Sacramento area, the typology is urban mixed-use landscape. The Central Valley from Sacramento to Bakersfield consists primarily of rural agricultural landscapes and traditional small urban community landscapes. Agriculture dominates the majority of the region with uniform topography of tilled fields, orchards, or undeveloped land. Agricultural areas also include highly visible utility poles and lines arranged along the major roadways (e.g., SR-99 and I-5) that form a dominant linear visual element in the landscape.

Locally designated scenic routes in the study area in this region include US-50 in Sacramento, Austin Road and East River Road in San Joaquin County, M and N Streets in Merced, and SR-198 in Visalia. Much of the proposed HST Alternative in this region would be adjacent to existing rail or highway corridors and thus would share the same affected environment.

The traditional small urban communities in the region range from clustered residential subdivisions outside Pixley (Figure 3.9-4) to the mixed commercial and residential uses of towns and cities like Visalia and Madera. For the Sacramento to Bakersfield region, urban settings are exemplified by the traditional downtown areas of Sacramento, Stockton, Modesto, Merced, Hanford, Fresno, and Bakersfield. Views of the Sacramento River are intermittently part of the landscape from along the I-5 corridor south of Sacramento.

Along each alignment option for the proposed alternative corridors in the region, views are generally sweeping vistas of rural agricultural landscapes and small urban communities. The proposed HST Alternative station sites range from undeveloped or agricultural sites (e.g., the Power Inn Road station site in Sacramento), to older station sites that are either in active use (e.g., Hanford) or underutilized (e.g., Fresno), to new or refurbished station sites that are pedestrian-scale (e.g., Truxtun Amtrak) or grand (e.g., downtown Sacramento Valley station).

For the Sacramento to Bakersfield region, the industrial settings include existing station sites as well as groupings of industrial buildings along the existing rail corridors. Figure 3.9-5, *Sacramento Power Inn Road,* looks south from Polk Street (and Power Inn Road) in Sacramento, illustrating a rural landscape with light industrial uses.

Bakersfield to Los Angeles

This region of southern California encompasses the southern portion of the Central Valley south of Bakersfield, the mountainous areas between the Central Valley and the Los Angeles basin, and the northern portion of the Los Angeles basin from Sylmar to downtown Los Angeles. Landscapes in this region transition from rural agricultural and traditional small urban communities south of Bakersfield, to highly scenic mountain range (natural open space) through the Tehachapi Mountains and Angeles National Forest, and finally into highly urban mixed-use landscapes in northern Los Angeles County.

State- and locally designated scenic routes in the region include 2.5 mi (4.0 km) along I-5, 2.2 mi (3.5 km) along Riverside Drive near Burbank, and 1.1 mi (1.8 km) along the Sierra Highway in Palmdale. Other scenic overlooks or viewing points along the I-5 Tehachapi corridor in the region include those in the Pyramid Lake Recreational Area in the Angeles National Forest north of the Santa Clarita Valley; views from the Golden State Highway, also in the Angeles National Forest south of Pyramid Lake; trails in the Towsley Canyon part of the Santa Clarita Woodlands Park, which is managed by the Santa Monica Mountains Conservancy; and trails near the Pacific Crest Trail south of Soledad Canyon Road in the Angeles National Forest.

Rural agricultural landscape characterizes the north part of the study area in the Central Valley between Bakersfield and the edge of the Tehachapi Mountains to the south. Urban/suburban landscapes characterize the greater Los Angeles metropolitan area, generally from the City of Santa Clarita south through the study area in the City of Los Angeles, with development density generally increasing from north to south. Rural desert landscape characterizes the Antelope Valley from the base of the Tehachapi Mountains to the town of Rosamond.

The area from Bakersfield to Sylmar includes the highly scenic natural open space landscapes described below along both the Tehachapi and Antelope Valley corridors.

- Pyramid Lake Recreation Area is in the Angeles National Forest north of the Santa Clarita Valley. Pyramid Lake, owned and operated by the California Department of Water Resources (DWR), is a reservoir of the State Water Project that provides boating, fishing, and swimming opportunities for visitors. The Vista Del Lago Visitors Center operated by DWR provides interactive exhibits on California's water and has balconies with telescopes for viewing the lake, as illustrated in Figure 3.9-6. I-5 is visible on the left of the view in the middle ground.
- The Angeles National Forest is considered a visually scenic resource because of the camping and other recreation opportunities it provides, and the largely undeveloped views it affords to visitors, as illustrated in Figure 3.9-7. The landscape shown in the figure is typical of similar mountain landscape views from within the Angeles National Forest from viewing points near I-5. Vehicles are visible on I-5, and high-voltage electrical towers are visible on the hills in the background.
- The Santa Clarita Woodlands Park, which is managed by the Santa Monica Mountains Conservancy, provides picnic facilities and trails for hiking, mountain biking, and equestrian uses. This park is considered a scenic resource because it is available to recreation users to enjoy a predominantly undeveloped setting that includes a variety of native plants and animals.
- The Tehachapi Pass south of SR-58 and east of the town of Keene includes scenic viewing points and landscapes considered scenic. The Tehachapi Pass Railroad Line, of which this loop along SR-58 is a part, is a national Historic Civil Engineering Landmark. This rail line, constructed between 1874 and 1876, averages a gradient of 2.2% along its 28-mi (45-km) length. The line is in constant use today, essentially unchanged 126 years after its completion.
- The Sierra Highway-Antelope Valley area is considered a scenic resource because Sierra Highway from Avenue S south to the City of Palmdale boundary is designated in the City of Palmdale general plan as a scenic highway. Una Lake can be seen from Sierra Highway. The Lake Palmdale dam is also visible.
- The Santa Clarita Floodplain portion of the Santa Clarita River floodplain is considered a scenic resource because it is designated an SEA by the County of Los Angeles. The primary purpose of SEAs, as described in Section 3.15, *Biological Resources and Wetlands,* is to preserve biological diversity in Los Angeles County. The county recognizes, however, that the natural open space in SEAs functions also as a visual amenity.
- The north wall of Soledad Canyon, illustrated in Figure 3.9-8, is considered a scenic resource because it is largely undeveloped and is visible to hikers on the Pacific Crest Trail and other

trails, as well as to motorists using unpaved roads in this area of the forest. This figure shows a landscape that is typical of views from the forest looking north in Soledad Canyon.

- Figure 3.9-9 illustrates Santa Clarita from Dockweiler Drive. The area south of SR-14 is considered a scenic resource because the predominantly undeveloped area beyond SR-14 is Los Angeles County-designated SEA. The undeveloped area beyond SR-14 comprises green curvilinear hills, ridges, and mountains covered with predominantly evergreen shrubs and trees with scattered grassland areas.
- Views of the Los Angeles Union Station (LAUS) area are considered scenic because LAUS is an important historic building listed in the National Register of Historic Places, as discussed in Section 3.12, *Cultural and Paleontolgical Resources*.

Los Angeles to San Diego via Inland Empire

This region of southern California includes the eastern portion of the Los Angeles basin from downtown Los Angeles east to the Riverside and San Bernardino areas and south to San Diego generally along the I-215 and I-15 highway corridors. The region extends approximately 150 mi (241 km) through a series of diverse, and in some cases, highly developed and populated landscapes. From LAUS east and south to March Air Reserve Base (ARB), the I-10 and I-215 highway and the HST study area travel through several large, intensively urbanized, interior valleys (urban mixed-use and urban suburban landscape typologies). From the area south of March ARB through the northern reaches of San Diego County, I-15 and the HST study area pass through valley and upland areas that are under active development pressure but that presently retain a relatively undeveloped and, in places, more rural appearance than the more developed urban areas of San Diego. From Escondido south to Mira Mesa, the upland areas through which the study area passes have a generally suburban appearance. South of Mira Mesa, the various alternative options would pass through a series of coastal valleys and then along the coastal plain.

In the areas along and in the immediate vicinity of the highway and HST corridors being considered in this analysis, there are no roadways officially designated state scenic routes. None of the alternatives in the region would pass within 0.25 mi (0.40 km) of a designated scenic corridor.

For much of the distance between LAUS and the northern fringes of Riverside, the HST alignment options being considered consist of existing rail corridors, along which the adjoining areas have been developed with industrial uses. To the east south of LAUS, the long-established industrial areas are characterized by a dense pattern of development. In the area around LAUS and around the historic centers of communities in the San Gabriel Valley and in Pomona, Ontario, and San Bernardino, the rail corridors pass through or adjacent to areas of urban mixed use that extend up to the railroad right-of-way with little or no buffer of industrial development.

The central area of Escondido and the southern end of the San Diego central business district have a traditional urban character, with a regular block and lot pattern, creating a grid of urban streets. These streets are lined with buildings of varying ages housing a variety of commercial, governmental, and institutional uses. In many cases, such areas include the long-established community centers and therefore contain older structures. Often these buildings have some architectural merit or symbolic importance. Although these areas are generally highly developed, there is often vegetation consisting of street trees, and in some cases small landscaped areas on lawns or in public open spaces. In some landscapes, there are historically and architecturally important structures and/or distant views of significant natural features. Pomona is one example. At several points along the rail corridor—particularly in Los Angeles, the older portions of the San Gabriel Valley, and central San Diego—there are areas of high-density urban mixed-use landscapes with housing close to the railroad rights-of-way.

For many miles along the alternative corridors in this region, the study area passes through or is adjacent to lower-density suburban neighborhoods of single-family homes. The residential scale of the structures and the presence of landscaping, fences, and other small-scale features characterize the landscape.

Approaching San Diego, several of the HST alignment options are located either immediately adjacent to or down the middle of existing freeways, (I-215, I-15, and I-5) as illustrated in Figure 3.9-10, *I-15 in San Diego*. The freeway landscape has a highly developed, large-scale, and highly linear appearance. Figure 3.9-11 illustrates a view from the eastern edge of Mission Bay Park.

<u>Los Angeles to San Diego via Orange County</u>

This region includes the western portion of the Los Angeles basin between downtown Los Angeles and Los Angeles International Airport (LAX), and the coastal areas of southern California between Los Angeles and San Diego, generally following the existing Los Angeles to San Diego via Orange County I-5 highway corridor. The existing local visual setting in the region ranges from highly urbanized landscapes to undeveloped areas. Much of the existing highway system in the southern part of the region parallels the coastline of the Pacific Ocean. I-5 (evaluated in this study under the Modal Alternative) provides only one or two isolated views of the ocean.

There are no local- or state-designated scenic corridors in the study area for visual resources in this region, though some highways (e.g., SR-1 along the coast) are considered eligible for designation as California State Scenic Routes and are located near the existing rail corridor. These routes do not offer continuous views of the ocean within the study area.

Landscapes and visual settings in the region include urban mixed-use and industrial landscapes. The majority of the existing rail corridor currently traverses dense development that includes warehouses, commercial and industrial buildings, and residential housing (areas in Los Angeles County and northern/central Orange County, for example). Limited landscaping and native vegetation exist in these industrial areas that are dominated by typically large, box buildings. There are areas of high-density housing (multifamily and single-family dwelling units) along the railroad right-of-way. Residential, commercial, and industrial building structures blend with the surrounding environment with neutral colors, tones, and textures. The historic areas typically include older structures, often with architectural importance, that vary in texture, size, and color. The area of a proposed rail station along the existing UPRR Santa Ana Line in Norwalk is highly developed with a mixture of commercial and industrial uses along with surrounding residential areas.

There are a number of suburban and traditional small urban community landscapes in the region that are located close to commuter and transportation hubs and surrounded by retail, business, and residential land uses. The city center and neighborhoods in these communities, such as Santa Ana, are separated by transportation corridors and/or undeveloped land.

The region is characterized by coastal towns and urban areas, historic districts, parks, and wildlife preserves. Calafia Park in San Clemente, Camp Pendleton, area beaches, and a number of lagoons are examples of parks and open space areas along the existing I-5 highway corridor. The Camp Pendleton area is undeveloped land with some large overhead transmission lines, industrial facilities (e.g., San Onofre Power Plant), and the I-5 corridor. .

3.9.3 Environmental Consequences

A. EXISTING CONDITIONS COMPARED TO NO PROJECT ALTERNATIVE

The existing conditions in 2003, or existing landscapes, are used as the baseline and are assumed to be representative for the analysis of potential visual impacts for the Modal Alternative and the HST Alternative. Though it is likely that the existing landscape character will change in each of the regions by the year 2020 due to development and urban growth, these changes are not possible to characterize at this time with precision. To base comparisons of alternatives on current conditions is to take a conservative approach. The extent of change to some of the landscapes (particularly the rural and open space landscapes) reported in this section may not be as pronounced as they appear in this impact evaluation.

The highway projects approved and funded for construction by 2020 and included in the No Project Alternative are described in Chapter 2, *Alternatives*. In most of the regions, these improvements or changes to the existing highways and airports are generally expansions or reconfigurations of existing facilities that would not result in substantial visual contrasts or changes to the dominant line, form, color, or texture characterizing the existing landscape condition. No significant visual impacts, shadow, or glare impacts have been identified for the changes between the existing conditions and No Project Alternative for this program-level analysis. As these projects advance, the project sponsors (not the California High Speed Rail Authority [Authority]) may identify and address some localized visual impacts in separate environmental documentation.

B. NO PROJECT ALTERNATIVE COMPARED TO MODAL AND HIGH-SPEED TRAIN ALTERNATIVES

The comparison of potential aesthetic and visual resource impacts for the Modal and HST alternatives is a broad overview of potential differences between alternatives for the construction (short-term) and operation (long-term), direct and indirect, and cumulative impacts.

<u>Modal Alternative</u>

Under this alternative, the potentially feasible highway improvements would represent about 2,970 lane mi (4,345 lane km) of new highway construction. Several intercity highways would be widened to a total of 12 lanes. Adding outside lanes to existing highways would involve vegetation clearing, cut and fill in areas where the topography is uneven, relocation of existing noise walls or construction of new noise barriers, reconstruction of existing ramps and bridges, and property acquisition along some constrained corridors. Construction-related activities and changes (equipment operation and movement of materials in adjacent staging areas, construction signage, jersey barriers [concrete bars about 3 ft high], temporary lane closures, and night lighting) would be highly visible to motorists and adjacent residents and businesses over a period of about 2 to 5 years in any one location and up to 17 years across the state, detracting from scenic landscape features along the highway corridors. The Modal Alternative would potentially contribute to temporary cumulative visual impacts during the construction period when added to the existing No Project Alternative.

The Modal Alternative would also result in potential long-term visual impacts from additional pavement, wider highway structures (interchanges, ramps, bridges), noise barriers, retaining walls, and open cuts in steep terrain, thus changing the dominant landscape characteristics in the study area along vast stretches of highway that traverse a variety of landscape types. Lanes added to bridges and elevated portions of the highway (two lanes would add approximately 24 ft [7 m]), and new stretches of noise barrier walls would cast additional shadows on landscapes below the structure and adjacent to the structure. Widened highways would also result in light and glare being closer to adjacent properties.

Though individually these landscape changes may not be considered significant because they would consist of additions to existing infrastructure, this alternative could contribute to substantial cumulative visual impacts during the next 17 years. Expanded paved surface would result in potential impacts on visual resources. Widening a two-lane or four-lane highway through the natural open space and rural landscapes of the state would result in both direct and cumulative visual impacts because the line, form, texture, and color of the highway would begin to dominate the landscape. Widening highways in suburban and urban areas of the state would contribute to cumulative visual impacts and shadow effects from elevated portions of highway and additional noise walls. The width of 12-lane highways would be approximately 185 ft (56 m), the width of eight lanes would be approximately 125 ft (38 m), and the width of six lanes would be approximately 100 ft (31 m). These pavement widths, together with the need for cut and fill to conform to grade changes and the elevated portions of bridges and ramps required by the Modal Alternative, would result in visual impacts similar to or greater than the HST Alternative along scenic corridors and through natural open space areas. Examples of such areas include the mountain passes (e.g., Diablo Mountain Range, Pacheco Pass, Tehachapi Mountains, Angeles Forest, and Soledad Canyon) and open rural agricultural lands south of San Jose and in the Central Valley. Figures 3.9-14 and 3.9-15 illustrate the potential impacts on SR-152 (Pacheco Pass) of the Modal and HST Alternatives.

In the Los Angeles to San Diego region, the difference between the No Project and Modal Alternatives would be substantial. The Modal Alternative would require the acquisition of approximately 1,100 ac (445 ha) of new right-of-way between Los Angeles and San Diego, 370 ac (150 ha) of which would be paved, to accommodate the highway and interchange widening proposed under this alternative.[2] The additional right-of-way would displace residential, commercial, and industrial land uses that have been established adjacent to the existing highway, as well as some areas of natural vegetation and rock slopes. Bridges and overpasses would be widened in urban, suburban, coastal, and open space environments, increasing the footprint of the highway as well as the width or extent of the shadow effects beneath the infrastructure.

The airport improvements would add runways and gates to existing airports, and these features would blend with existing landscape features. Therefore, no visual impacts have been identified for the airport part of the Modal Alternative.

<u>High-Speed Train Alternative</u>

A typical double-track HST, at grade, would have a 50- to 100-ft (15- to 31-m) fenced right-of-way, and an elevated guideway would have a 50-ft (15-m) right-of-way. The 100-ft width would be comparable to a six-lane highway. Catenary supports 26 ft (8 m) in height would be located every 30 ft (9 m) along both sides of the track to support the electric wires that supply power to the trains. The proposed HST alternative would include using existing rail tracks or parallel tracks or highways where feasible, and tunneling through the scenic mountainous area. (See Chapter 2, *Alternatives*, for full description of proposed HST alignment options.). About 194 mi (312 km) of tunnel has been identified for this conceptual stage of design.

The proposed HST Alternative would be built in phases. Construction of the system would have short-term impacts on visual resources similar to those described for highway construction above in the discussion of the Modal Alternative. Construction equipment, staging areas with construction materials, signage, and night lighting would be visible from adjacent properties and roadways during the construction period.

[2] Acres of right-of-way for the Modal Alternative are estimated based on the need for a minimum of 25 ft (8 m) of additional pavement width, and 50 ft (16 m) of unpaved width for drainage, cut and fill, and other unpaved area, for the length of I-5 between Los Angeles and San Diego.

Long-term visual changes would result from the introduction of a new transportation system that would be visible along many major highways and rail corridors connecting the metropolitan areas of the state. The track, catenary, fencing, 12-ft (4-m) to 16-ft- (5-m) high soundwalls (where proposed), approximately 220 mi (354 km) of elevated guideway (where proposed), and the trains themselves would introduce a linear element into the landscape that would have potential cumulative visual impacts when considered with the strong linear element of the existing highway and rail facilities that the HST would parallel. The significance of the visual change would depend on the sensitivity of the landscape and the compatibility with existing landscape features of the typologies along each of the alignment options described in the affected environment section. The landscape typologies considered scenic and therefore most subject to high-contrast visual changes—where the HST would begin to dominate the landscape and detract from the existing features—are the natural open space and park typology and the traditional small urban community typology.

At this program level of analysis, there are no potentially high aesthetic or visual impacts that could not be reduced or mitigated through design treatments (e.g., architectural treatment at historic stations, tunneling, or minimizing the cut and fill through mountainous terrain and in natural areas). Similar construction-related and long-term visual changes would occur under both the Modal and HST Alternatives, particularly in highly scenic areas of the state. Both alternatives would contribute to cumulative visual impacts from construction and shadow effects of elevated structures.

3.9.4 Comparison of Alternatives by Region

Table 3.9-1 summarizes the key findings for each of the alternatives by region. The table identifies the highways in the proposed Modal Alternative and the proposed HST alignment options and stations in each of the five regions that would have potential significant visual impacts (high visual contrasts).

Table 3.9-1
Potential Visual Impacts by Region

Alignment and Station Options	Scenic Highway	Scenic Viewing Point/Landscape	High Contrast/Impact	Shadow Impact	Light/Glare
Bay Area to Merced					
Modal Alternative					
SR-152/US-101 to I-5	35 mi (56 km) designated scenic highway	10–20 viewing points Pacheco Creek Valley, scenic natural open space	High contrast in color, line, and form from enlarged cut/fill, expanded two lanes of pavement, removal of vegetation	High—widened bridges, ramps	Lights from increased auto use at night
High-Speed Train Alternative					
Hayward/Niles/ Mulford alignment	6 mi (10 km) (Niles Creek)	4 viewing points historic town of Niles	High contrast of elevated guideway with historic town and scenic canyon	Moderate	Low
Pacheco Pass options	30 mi (48 km)	10-20 viewing points Pacheco Creek Valley, scenic natural open space	High contrast in line and color from elevated guideway over hwy. and catenary and tunnel portal	Moderate—elevated guideway	Low—glare from locomotive lights
Diablo Range Direct options		Natural open space, Henry Coe State Park Orestimba Valley, I-5	Aerial guideway, cut/fill, catenary, tunnel portal	Moderate—elevated guideway	Locomotive lights
Sacramento to Bakersfield					
Modal Alternative			Low visual contrasts		
High-Speed Train Alternative					
UPRR options	0–6.3 mi (0–10.1 km)	0 viewing points	Low visual contrasts	Low—at grade	Low
BNSF options	0.8–6.7 mi (1.28–10.8 km)	0 viewing points	Low visual contrasts	Low—at grade	Low
Stations at Power Inn Road, Stockton ACE, Modesto, Merced, Castle Air Force Base, Visalia, Bakersfield Airport	None	None	Moderate to high visual contrasts with traditional rural community historic architecture in highly visible landscapes	None	Low to moderate light and glare around stations

Alignment and Station Options	Scenic Highway	Scenic Viewing Point/Landscape	High Contrast/Impact	Shadow Impact	Light/Glare
Bakersfield to Los Angeles					
Modal Alternative					
I-5: SR-99 to SR-14; and SR-14: Palmdale to I-5		Pyramid Lake scenic viewing from Visitors Center and Castic Lake Viewing Point from visitor rest area	Moderate contrasts from cut required along hillside, removal of vegetation	No shadow impacts	Increased lights from auto use
I-5: SR-14 to I-405	2.5 mi (4 km) of scenic corridor along I-5		Moderate contrast from double-decking of four lanes for about 4 mi (6 km) over I-5, contrast with scale of urban features	No shadow impacts, existing double-deck sections	Increased lights from auto use
High-Speed Train Alternative					
I-5: Tehachapi corridor	None	2 viewing points: Pyramid Lake scenic viewing point (412 ft [126 m]) and Castic Lake scenic viewing points 0.4 mi (0.6 km) and 0.7 mi (1.1 km)	High-contrast impacts from elevated structure and catenary at edge of Pyramid Lake adjacent to I-5; and cut/fill and tunnel portals in hillside of Santa Clarita Woodlands Park. Moderate contrast from cut and fill for 7.5 mi (12 km) where alignment is close to I-5. Moderate contrast across valley in front of Castic Lake.	Shadow impacts on Pyramid Lake and recreational users within 75 ft (23 m) of elevated structure	
SR-58 corridor	None	Tehachapi Loop Marker 0.7 mi (1 km) from alignment	Contrast with historic Tehachapi Pass Rail, and moderate contrast from cut/fill in hillside for about 12 mi (19 km)	None	
Soledad Canyon corridor	Sierra Highway in City of Palmdale	None within 0.25 mi (0.40 km) of alignment	The elevated guideway and catenary across the scenic Sierra Hwy. and adjacent to Santa Clarita River SEA would contrast with the existing landscape features. Cut/fill, tunnel portals would be visible against natural open space hillsides, and ridges in Angeles National Forest.	Shadow impacts of elevated guideway	

Alignment and Station Options	Scenic Highway	Scenic Viewing Point/Landscape	High Contrast/Impact	Shadow Impact	Light/Glare
Los Angeles to San Diego via Inland Empire					
Modal Alternative			Low visual contrasts for all Modal (highway and airport improvements) in landscapes previously modified	Low	Light and glare from increased traffic
High-Speed Train Alternative					
UPRR Colton Line to March ARB	None	Viewing points are from residential streets.	High visual contrast in urban suburban landscape where alignment is in center of arterial street through residential neighborhood east of the UC Riverside campus	High shadow impacts	
UPRR Colton Line to San Bernardino	None	Viewing points are from residential streets.	High visual contrast in urban suburban landscape where alignment is through established residential neighborhood in Rialto and San Bernardino	High shadow impacts	Low to moderate light and glare at station
San Jacinto to I-5	None	Viewing points are from residential streets.	High visual contrast from long segments of elevated structures in median of highway	High shadow impacts	
Downtown San Diego	None		Elevated guideway in urban mixed use landscape would block views of Bay	High shadow impacts	
Los Angeles to San Diego via Orange County					
Modal Alternative					
I-5 San Juan Capistrano to Del Mar	None	Coastal communities with high aesthetic qualities, limited views of the ocean	Moderate visual contrasts from extensive cut and fill of natural hillsides (removal of vegetation) and rock slopes, and widened sections of elevated highway and bridges; medium impacts in scenic lagoon areas	Shadow impacts of elevated sections of widened highway, medium impacts at lagoons and open space areas	Light and glare from increased auto use
High-Speed Train Alternative					
Los Angeles to Irvine	None		Low visual contrasts	Low at-grade	Low to moderate light and glare at stations

As shown in the above table, potential high-contrast visual impacts on the highly scenic mountain passes and open space landscapes have been identified for both the Modal and HST Alternatives in the Bay Area region (Pacheco Pass and Diablo Mountain Range), and in the Bakersfield to Los Angeles region (Pyramid Lake and Soledad Canyon). For the proposed HST Alternative, about 95 mi (153 km) of potential alignments through the scenic natural areas shown on conceptual design maps are proposed to be placed in tunnel through the Pacheco Pass and Diablo Range. For the Los Angeles to Bakersfield region, about 38 mi (62 km) of the potential HST corridor are proposed to be in tunnel in the mountainous area, and about 5 mi (8 km) would be in trench. The plan and profile of the alignments would be decided in the subsequent phase of the project development.

Shadow impacts would result from expanded highway bridges (Modal Alternative), from elevated guideways (HST Alternative), and from noise barriers for both alternatives. For all five regions, the potential visual impacts from the HST Alternative would generally be greater than visual impacts described for the Modal Alternative, primarily because the proposed HST system would introduce a new design feature to the landscapes, and the Modal Alternative would be an expansion of existing facilities. None of these potential impacts are unavoidable at this stage of review. Subsequent analysis and engineering design for the proposed HST Alternative would address feasible alignment options to further reduce visual impacts for areas identified as potential high visual contrasts with existing landscape features.

Following is a summary of the key differences among alternatives and potential HST alignment options for each of the five regions. The bulleted text in the HST discussion briefly summarizes the key differences among HST alignment options for each region.

A. BAY AREA TO MERCED

<u>Modal Alternative</u>

As part of the Modal Alternative, the expansion of SR-152 from four lanes to six lanes from US-101 in the Gilroy area to the junction with SR-156 north of Hollister would be most sensitive to potential visual impacts. This winding two-lane highway traverses agricultural and mountainous landscapes, passing through scenic rural, village, and wetland settings. Widening and straightening the highway through this scenic area would involve removal of vegetation and expanded cut and fill that would add to the dominant line and color of the existing highway and detract from the natural landscape features.

<u>High-Speed Train Alternative</u>

- The UPRR main line north of Hayward would have less potential visual impact than the Burlington Northern Santa Fe (BNSF) Niles Branch that would impact the historic town of Niles near the mouth of the scenic Niles Canyon.
- The I-880 option would have less potential visual impact than the Mulford Line option that crosses the Don Edwards San Francisco Bay National Wildlife Refuge.
- The northern tunnel option would “fly” over a residential neighborhood and result in shadow impacts before entering a highly visible tunnel portal to cross through the Diablo Mountain Range. This option would pass north of Henry Coe State Park and would cross the Diablo Range in a series of tunnels; the tunnel under the park option would cross under Henry Coe State Park. These options would have less potential visual impact than the at-grade option across Henry Coe State Park.
- The Pacheco Pass crossing would potentially impact visual resources less than the more northern Diablo Range options because it would parallel the existing linear feature of SR-152 before going in tunnel to cross the natural area of Pacheco Pass.

B. SACRAMENTO TO BAKERSFIELD

Modal Alternative

No potential visual impacts were identified for the highway improvements included in the Modal Alternative or airport improvements in this region.

High-Speed Train Alternative

All potential HST alignment options in this region were ranked as having low potential for visual impacts; only stations would have potential visual impacts because of the proximity to historic structures and architecture. The loops around the center of towns would have less visual impact than the alignment options going through town centers; however, they would be visible from long distances as new alignments in the less-developed bypass areas.

C. BAKERSFIELD TO LOS ANGELES

Modal Alternative

There are two scenic corridors adjacent to two of the segments of the Modal Alternative in this region. The I-5: SR-14 to I-405 segment is adjacent to 2.5 mi (4 km) of a designated scenic route along I-5 between SR-14 and I-405. There would be moderate visual contrasts on this corridor from the double-decking of four lanes over I-5. The I-5: SR-99 to SR-14 segment of highway would be widened by two additional lanes, and this segment would be visible from the Pyramid Lake Visitor Center, and from the Castic Lake Viewing rest area where views of a wider roadway and expanded cut of the hillside would contrast with the natural landscape.

High-Speed Train Alternative

The following HST alignment options would result in the lowest impacts on aesthetics and visual quality in this region.

- The I-5 corridor with the Wheeler Ridge alignment option to Bakersfield would result in the lowest aesthetics/visual quality impacts of the alignments between Bakersfield and Sylmar. Moderate contrast impacts associated with cut and fill would occur along approximately 7.5 mi (12 km) where the alignment would be close to I-5 and/or adjacent to existing roads that parallel I-5. Contrast impacts would be lower in these areas because the landform has previously been graded and altered for these existing roads. Visual impacts would therefore be minimized by locating the alignment in the area of the existing transportation corridor. In comparison, the SR-58/Soledad Canyon corridor would result in approximately 6.2 mi (10 km) of high-contrast cut-and-fill impacts in Soledad Canyon and 11.8 mi (19 km) of high-contrast cut-and-fill impacts in the mountainous area of SR-58. The landform in the mountainous areas on the Antelope Valley corridor would be largely unaltered. Visual contrast related to cut and fill in these areas would therefore be greater than along the I-5 corridor. Both the I-5 corridor and the SR-58/Soledad Canyon corridor would have high-contrast impacts and high potential shadow impacts related to aerial structure.
- Both the Wheeler Ridge and the Union Avenue alignment options of the I-5 alignment would have high-contrast impacts related to aerial structure. The Wheeler Ridge alignment option would have low potential shadow impacts on residential areas, however, while the Union Avenue alignment option would have moderate potential shadow impacts on residential areas.

D. LOS ANGELES TO SAN DIEGO VIA INLAND EMPIRE

Modal Alternative

The highway and airport expansions described for this region would not have potentially high visual contrasts because the changes to these facilities would be in landscapes that have been substantially modified already.

High-Speed Train Alternative

- In the LAUS to March ARB segment, the additional potential high-contrast impacts and shadow impacts of the San Bernardino loop would expose the two alignment options that would include this loop to more high visual impacts than the two alignment options that would not include this loop.
- In the March ARB to Mira Mesa segment, the alignment option that would serve the proposed Escondido Transit Center station site would have slightly more high visual potential impacts than the other alignment option. This difference is due to the relatively greater potential for high-contrast and shadow impacts in the subsegment associated with the transit center station.
- In the Mira Mesa to San Diego segment, the two alignment options that would join the coast and serve downtown San Diego would have more potential high visual impacts than the alignment option that would serve the Qualcomm Stadium station. This outcome is due to the relatively greater potential for high-contrast and shadow impacts expected in this segment. A scenic viewing point included in the two alignment options serving downtown San Diego also would not occur in the other alignment option.

E. LOS ANGELES TO SAN DIEGO VIA ORANGE COUNTY

Modal Alternative

The Modal Alternative would potentially increase the visual mass of the existing I-5 freeway, interchanges, bridges, and overpasses throughout its length from Los Angeles to San Diego. The existing right-of-way would need to be widened in most areas, resulting in displacement of uses built up to the right-of-way and reduction of undeveloped or landscaped areas along the freeway. In the northern and southern stretches of the freeway corridor (Los Angeles to San Juan Capistrano, and south of Del Mar to downtown San Diego), these changes to the landscape would result in overall low visual impacts. In areas between San Juan Capistrano and Del Mar, visual impacts would generally be higher (medium) due to more alteration of adjacent uses and the need for some extensive cut-and-fill activities in areas of natural hillsides and rock slopes. All elevated portions of the freeway and interchanges would be widened, increasing the shadow impacts on uses underneath the elevated infrastructure and expanding the dominance of the line and form of the existing infrastructure from viewing points along SR-1 (Pacific Coast Highway) and coastal trails. Shadow impacts would be noticeable in the residential and natural open space areas, such as crossing of lagoons in San Diego County.

High-Speed Train Alternative

In some locations along the LOSSAN corridor, the HST Alternative presents opportunities to improve the existing visual environment with alignment and/or construction options that would place existing and new rail infrastructure in a covered trench. The covered trench option in Orange and Santa Ana Counties (LAUS to Irvine segment) would place the existing at-grade rail tracks in a covered trench. This option would have a beneficial impact in the urban/suburban environment, while the option of constructing a second track at grade would have a low impact.

The implementation of some or all of the beneficial options above would improve the scenic quality along the existing LOSSAN corridor in residential areas along the corridor. Neither the No

Project nor the Modal Alternative would provide these opportunities for improving the aesthetic environment.

3.9.5 Photo Simulations of Alternatives in Selected Scenic Areas

Figures 3.9-16 to 3.9-21 are photo simulations that illustrate what the Modal or HST Alternatives (expanded highways or HST) may look like in typical landscapes described for each of the regions, using existing conditions as the baseline. These simulations do not include potential changes to the existing landscapes that could occur between the time of this analysis and the year 2020 from other projects and urban development. These simulations are meant to illustrate how the existing dominant landscape features would be potentially changed with the implementation of the proposed alternatives. Below is a brief description of the photo simulations.

- Figure 3.9-16A and 3.9-16B: Historic Gilroy station with and without HST station. These figures illustrate how the proposed HST station could be integrated with an existing historic structure. The Gilroy station is representative of historic stations, predominantly of those in the Central Valley areas (Bay Area to Merced and Sacramento to Bakersfield).
- Figures 3.9-17A and 3.9-17B: Pixley with and without HST alignment. These figures illustrate how the proposed HST alignment could potentially impact a traditional small urban community. It should be noted, however, that this particular area is already impacted by US-99, which is located adjacent to the proposed HST alignment, the viewpoint from which the picture without HST was taken. Under the Modal Alternative, the visual impact would be a widening of US-99 into the area where the proposed HST alignment is pictured and on the other side of the highway.
- Figures 3.9-18A and 3.9-18B: Soledad Canyon with and without the proposed HST alignment in cut configuration. These figures illustrate how a scenic resource could potentially be impacted by HST alignment in a cut configuration. It should be noted that this impact could potentially be avoided or mitigated by placing the HST alignment in tunnel or by using other construction and landscaping techniques to reduce visual impact.
- Figures 3.9-19A and 3.9-19B: I-15 corridor in San Diego with and without the proposed HST alignment. These figures illustrate how the proposed HST alignment could be integrated alongside an existing highway alignment. It should be noted that along this alignment, the HST alignment in some portions would be in tunnel and would not be visible from the highway or the surrounding area. Under the Modal Alternative, the visual impact would be a widening of I-15 into the area where the HST alignment is pictured and on the other side of the highway (Figure 3.19-C).
- Figures 3.9-20A and 3.9-20B: I-5 corridor in La Jolla with and without the highway widening improvements proposed under the Modal Alternative. These figures illustrate how the addition of one through lane in each direction affects the ramps (moving them into the hillsides) and overcrossing structure (reconstructing the abutments). The improvements would be visible from the highway, and in the case of the ramps visible from the surrounding hillsides as well.
- Figures 3.9-21A and 3.9-21B: Little Italy, downtown San Diego, water view with and without HST alignment. These figures illustrate how the HST system could be integrated into a developed urban region. The potential impact of the HST alignment would be relative to the position of the viewer. For instance, in this case the potential impact would be greatest closest to the alignment, while from the location where the picture was taken, the proposed HST alignment blends into the built area.

3.9.6 Design Practices

It would be speculative to address specific aesthetic treatments at the conceptual level of design of this program level study. However, the Authority is committed to working with local agencies and communities during subsequent project level environmental review to develop context sensitive aesthetic designs and treatments for HST infrastructure (bridges, tunnel portals, overhead catenary systems, stations, etc.).

3.9.7 CEQA Significance Conclusions and Mitigation Strategies

Based on the analysis above, and considering the CEQA Appendix G thresholds of significance for aesthetics, the HST alternative would have a potentially significant impact on aesthetics when viewed on a system-wide basis. The HST alternative would create construction-related short-term visual changes. The HST alternative would also create long-term visual changes from introduction of a new transportation system. While the significance of the changes is dependent on the sensitivity of the landscape and compatibility with existing landscape features, at least some changes would occur in highly scenic areas of the state and are expected to be significant. Mitigation strategies, as well as the design practices discussed in Section 3.9.5, will be applied to reduce this impact. See also Section 3.7.6, Part B, mitigation for communities and neighborhoods.

General mitigation strategies would include the design of proposed facilities that are attractive in their own right and that would integrate well into landscape contexts, so as to reduce potential view blockage, contrast with existing landscape settings, light and shadow effects, and other potential visual impacts. Further consultation with local and regional agencies and with the public would help the Authority and the FRA refine these general mitigation strategies during the following stage of environmental review. The following measures could be considered during subsequent review and design development to enhance project appearance and minimize project visual impacts.

In the development of the final design for the project, there is a need to generate design solutions that lead to development of project facilities that are attractive in their own right and that integrate into landscape contexts in a way that minimizes view blockage, contrast with settings, light and shadow effects, and other visual impacts. Some of the potential mitigation strategies that could enhance project appearance and minimize project visual impacts include:

- Bridges and elevated guideways could be designed with graceful lines and with minimal apparent bulk and potential shading effects. Features that could be considered include use of contoured, rounded edges for columns and other structural elements.
- Elevated guideway, station, and parking structures could be designed with sensitivity to the context. Exterior materials, colors, textures, and design details could be used that are compatible with patterns in the surrounding natural and built environments and that minimize the contrast of the structures with their surroundings.
- Exterior finishes for catenary support structures could be chosen that have neutral colors, are context-appropriate, and have dulled finishes that minimize reflectivity.
- Aesthetically appropriate fencing could be installed along rights-of-way. In residential and city center areas, decorative fencing may be appropriate. In all contexts, the fencing could be dark and non-reflective to reduce its visual contrast.
- Where at-grade or depressed route segments pass through or along the edge of residential areas or heavily traveled roadways, landscape treatments could be installed along the edge of the right-of-way such as trees, shrubs, and groundcover to provide partial screening and to visually integrate the right-of-way into the residential context.
- Night lighting at stations should be the minimum required for operations and safety. All lights should be hooded and directed to the area where the lighting is required. For lights that are not required to be on all the time, sensors and timers should be specified.
- In the project-level review of proposed stations, the potential shadow impacts on adjacent pedestrian areas, parks, and residential areas should be taken into account.

- Areas outside of the operating rail trackbed that are disturbed by cut, fill or grading will be seeded or planted, as feasible, such that these areas will blend with the surrounding vegetated areas. Native vegetation will be placed in appropriate locations and densities to fit adjacent natural settings. Appropriate native or ornamental species will be used adjacent to developed and landscaped areas. Steep areas of cut in rock may not be able to support plants.
- In areas where elevated guideways are close to residential areas, parks, and public open spaces, use of strategic plantings of fast-growing trees to provide partial or full screening of the structures.
- Where at-grade or depressed route segments pass through or along the edge of residential areas or heavily traveled roadways, landscape the edge of the right-of-way with trees, shrubs, and groundcovers to provide partial screening and to visually integrate the right-of-way into the residential context.
- Where elevated guideways are located down the median strips or along the edge of freeways or other major roadways, use appropriate landscaping of the area under the guideway. The landscaping should make use of attractive shrubs and groundcovers that provide a high level of visual interest. The emphasis should be on the use of low-growing species to minimize any additional shadow effects or blockage of views.
- In the development of the final site plans for stations, shadow impacts on adjacent pedestrian areas, parks, and residential areas should be taken into account, and all structures should be sited in a way that minimizes shadow effects on sensitive portions of the surrounding areas.
- New outdoor lighting associated with the project can be shielded to minimize both the glare from any new light source and the spillover of light onto developed and undeveloped areas outside of the right-of-way.

The above mitigation strategies are expected to substantially lessen or avoid impacts to aesthetics in many circumstances. Sufficient information is not available at this programmatic level, however, to conclude with certainty that the above mitigation strategies will reduce impacts to aesthetics to a less than significant level in all circumstances. This document therefore concludes that impacts to aesthetics could remain significant, even with the application of mitigation strategies. Additional environmental assessment will allow a more precise evaluation in the second tier project-level environmental analyses.

3.9.8 Subsequent Analysis

Specific analyses that would be appropriate for project-specific environmental evaluation are discussed below.

- Detailed analyses should be performed along each corridor, particularly in areas with elevated structures, to identify potential visual intrusions into residential and park and open space areas. These analyses should focus on identifying the potential for blockage of valued views; the areas where shadows would be cast on residential and open space lands; and the areas where the scale, form, line, and color of project facilities would substantially alter the existing character and quality of the setting. In addition to producing a detailed inventory of area-specific impacts, this analysis would serve as the basis for identifying areas where project siting adjustments and design modifications, landscaping, and other mitigation measures may be incorporated to reduce potentially considerable impacts to a low level.
- Review of local urban design plans and policies should be conducted to take into account local design objectives. The analyses would provide a basis for considering specific design measures that would modify the impacts of the project in ways that would make the project design more consistent with local urban design goals.
- An analysis should focus on the segments of alignment that would be located adjacent to and down the median strip of freeways.

- For each of the proposed station sites, further analyses should be conducted in consultation with local agencies to develop an understanding of the relationship of the proposed station architecture, parking lots, lighting systems, and other features to the surrounding natural and built setting and historic context of the surrounding landscape setting. The analyses should identify the potential for blockage of valued views; the areas where shadows would be cast; and the areas where the scale, form, line, and color of project facilities could be designed to blend with the surrounding landscape. The analyses would be used to provide a basis for considering specific measures that could be integrated into the final station designs to reduce the visual impacts of the stations on their surroundings.

3.10 PUBLIC UTILITIES

This section describes the existing public utilities within the five project regions and identifies the potential for impacts on utility systems for the No Project, Modal, and High-Speed Train (HST) Alternatives. The public utilities evaluated in this section include electrical transmission lines, natural gas facilities, and wastewater treatment facilities. A *potential utility impact* is any potential conflict between an alignment, station, or airport facility, and a utility, including crossings regardless of depth or height.

3.10.1 Regulatory Requirements and Methods of Evaluation

A. REGULATORY REQUIREMENTS

California Public Utilities Commission
The California Public Utilities Commission (CPUC) primarily regulates the provision of privately owned utilities in California. These utilities include privately owned telecommunications, electric, natural gas, water, railroad, rail transit, and passenger transportation companies. The CPUC is responsible for assuring that California utility customers have safe, reliable utility services at reasonable rates; protecting utility customers from fraud; and promoting the health of California's economy. The CPUC does not issue permits for proposed projects that would cross utility lines. The CPUC does, however, regulate at-grade rail crossings.

Office of the State Fire Marshall
The Office of the State Fire Marshall, Pipeline Safety Division, regulates the safety of approximately 5,500 mi (8,851 km) of intrastate hazardous liquid (e.g., oil, gas) transportation pipelines and acts as an agent of the Federal Office of Pipeline Safety concerning the inspection of more than 2,000 mi (3,219 km) of interstate pipelines. Pipeline safety staff inspects, tests, and investigates to ensure compliance with all federal and state pipeline safety laws and regulations. All spills, ruptures, fires, or similar incidents are responded to immediately; all such accidents are investigated for cause.

Research and Special Programs Administration, U.S. Department of Transportation
The Research and Special Programs Administration, U.S. Department of Transportation, is responsible for carrying out the duties regarding pipeline safety set forth in 49 U.S.C. § 60101 *et seq.* and 49 C.F.R. § 190.1. The regulations apply to the owners and operators of the facilities and cover the design, installation, inspection, emergency plans and procedures, testing, construction, extension, operation, replacement, and maintenance of pipeline facilities transporting oil, gas, and hazardous liquid. The regulations require operators of gas pipelines to participate in a public safety program, such as a one-call system that would notify the operator of any proposed demolition, excavation, tunneling, or construction that would take place near or affect the facility.

Wastewater Regulatory Setting
Many regulatory agencies are involved in wastewater treatment oversight. These agencies include the U.S. Environmental Protection Agency, the California Water Resources Control Board, and nine California Regional Water Quality Control Boards (RWQCBs). Primary wastewater regulation occurs via the issuance of wastewater discharge standards that are implemented through National Pollutant Discharge Elimination System permits and waste discharge requirements issued by the various RWQCBs.

Wastewater conveyance and treatment facilities in the study area are owned and/or operated by different agencies and entities. Any potential conflict with such facilities would be addressed in consultation with the respective agency. If a proposed alternative would potentially include use of wastewater facility properties, during the project-level review the need for easements, agreements, or other arrangements with the agency and/or local jurisdiction would be considered and addressed.

B. METHOD OF EVALUATION OF IMPACTS

Various methods, including the following, were used to gather the appropriate information for each of the regions.

- Review of the project geographic information systems (GIS) to identify cities and counties in the study area.
- Review of the general plans for potentially affected communities within each of the five regions in which proposed alternatives are being studied, as well as maps from the Thomas Bros. *California Atlas* and from the California State Automobile Association.
- Review of project alignments/proposed improvements against GIS information of electrical transmission lines, and gas and oil pipelines compiled by MapSearch.
- Exploration of Web sites of the GIS-identified cities and counties in the study area to gather appropriate setting information.
- Examination of applicable utility system maps and Web sites to gain a better understanding of facility distribution.
- Contact with public utility providers via mail to obtain or confirm the locations of their current and planned services and facilities in the study area.

Public utilities can generally include a range of services such as water, power, sewage, communications, and other systems. For the purposes of this analysis, three of the most common major facilities that may pose construction challenges were identified to best represent potential utility impacts. These facilities not only provide critical services, they are likely to create a hazard if damaged during construction operations.

- Electrical facilities are defined as major transmission lines and substations that meet or exceed a power rating of 230 kilovolts (kV).
- Natural gas facilities are defined as high-pressure gas pipelines and facilities of various sizes.
- Wastewater treatment facilities are defined as wastewater pipelines with a minimum 36-in (91-centimeter [cm]) diameter, and any treatment facilities located in the project corridor.

The methodology used to assess potential conflicts (any crossing or longitudinal encroachment of an existing utility by the defined improvement) included overlaying the available utility maps with the alternative alignments and identifying facilities within 100 ft (30 m) of the centerline and the proposed alignment alternatives. Because public utilities are so prevalent throughout the study area, it was not practical to assess each potential conflict. Rather, the relative impact between alternatives was determined by quantifying the number and type of potential conflicts for each alternative. In addition, a qualitative ranking of high, medium, or low was assigned to describe the potential severity of the conflict, as described below and summarized in Table 3.10-1.

Electric transmission lines, telecommunications lines, natural gas pipelines, and wastewater pipelines would be less likely to be affected by an alternative because with relatively minimal disruption or construction impacts, they could be avoided, minimized, or mitigated by routing either the public utility or the transportation improvement around, over, or under the facility. Where unavoidable, relocations of the utilities would not pose adverse environmental risks, based on current construction practices. However, they do represent additional project-related costs.

- Fixed facilities, such as electrical substations or power stations and wastewater treatment plants, would be more likely to be affected by an alternative, because they could require more considerable engineering, design, and construction to avoid, minimize, or mitigate potential conflicts. These types of fixed facilities have more significant constraints regarding any potential conflict, such as routing the transportation improvement around, over, or under the facility, or relocating the fixed facility to another location.

Table 3.10-1
Rankings for Potential Public Utilities Impacts/Conflicts

	Electrical Facilities	Natural Gas Lines	Waste Treatment Facilities
Low	No 230-kV or greater facility within study area	1 to 15 gas lines within study area	No wastewater pipelines of 36-in (91-cm) diameter or greater or treatment facilities within study area.
Medium	N/A*	16 to 30 gas lines within study area	N/A*
High	One or more 230-kV substation, power station, or greater facility within study area	31 or more gas lines within study area	Wastewater pipelines of 36-in (91-cm) diameter or greater or treatment facilities within study area.

* N/A = not available. There is no medium rating for this category; impacts are either low (no facilities in the segment) or high (one facility or more in the segment).

The analysis indicated that with regard to potential conflicts with utilities, there was little difference among the proposed alternatives. This is because utilities generally do not present significant potential impacts that cannot be avoided, minimized, or mitigated through conventional design and construction processes. For instance, most potential conflicts typically would be identified during the design or construction stage of a project, and standard measures would be taken to minimize costs and disruption of service.

3.10.2 Affected Environment

A. STUDY AREA DEFINED

The study area for public utilities encompasses the area within 100 ft (30 m) of the centerline of each alignment, and 100 ft (30 m) around stations and airports. The study area is generally located within developed and urbanized areas throughout the five study regions. These areas typically include various underground, at-grade, and elevated utilities that provide water, power, communications, and sewage service to residential, business and manufacturing, and agricultural practices. The following section provides additional information on utility resources.

B. GENERAL DISCUSSION OF PUBLIC UTILITIES

As shown in Figure 3.10-1, a representative segment of the proposed HST Alternative in the Los Angeles to San Diego via Inland Empire region illustrates the difficulty in avoiding conflicts with utilities that are present in virtually every segment in the study area. This condition is common across all regions and alignment and design options under consideration.

C. PUBLIC UTILITIES BY REGION

The key service providers and resources in each of the five regions are summarized below. A complete description of these providers and resources is provided in Appendix 3.10-A.

Bay Area to Merced

This region includes central California from the San Francisco Bay Area (San Francisco and Oakland) south to the Santa Clara Valley and east across the Diablo Range to the Central Valley.

- Electrical Facilities—Providers include the Pacific Gas and Electric Company (PG&E), Silicon Valley Power, and City of Palo Alto Utilities (CPAU). There are two power-generating facilities within the region (Santa Clara power plant and Gilroy Cogeneration Plant LP).
- Natural Gas Facilities—Provided by PG&E with the exception of the City of Palo Alto. In the City of Palo Alto, CPAU gas is purchased from commodity suppliers and transported via PG&E's system to CPAU's distribution system.
- Wastewater Treatment and Water—Provided by more than 50 cities and other special districts within the region.

Sacramento to Bakersfield

This region of central California includes a large portion of the Central Valley (San Joaquin Valley) from Sacramento south to Bakersfield.

- Electrical Facilities—Provided by PG&E, Sacramento Municipal Utility District (SMUD), and Southern California Edison.
- Natural Gas Facilities—Provided by PG&E.
- Wastewater Treatment—There are three wastewater treatment facilities: Atwater Wastewater Treatment Plant (adjacent to SR-99), Ceres Water Reclamation Facility, and Cross Valley Canal Treatment Plant. Wastewater service is generally provided by each city or other special district within the region.

Bakersfield to Los Angeles

This region of southern California encompasses the southern portion of the Central Valley south of Bakersfield, the mountainous areas between the Central Valley and the Los Angeles basin, and the northern portion of the Los Angeles basin from Sylmar to downtown Los Angeles.

- Electrical Facilities—Providers include Los Angeles Department of Water and Power (LADWP), City of Burbank, Southern California Edison (SCE), and PG&E. The MacNeil Substation and a 42-megawatt (MW) natural gas/fuel-to-oil electricity power plant are located in the Burbank area.
- Natural Gas Facilities—Providers include Southern California Gas (SCG) and PG&E. Natural gas facilities are provided by pipeline by PG&E.
- Wastewater Treatment—The region is predominantly served by Los Angeles County Sanitation District, Los Angeles City, Rosemund Community Services District, City of Tehachapi Public Works, Mojave Public Utilities Districts, and City of Bakersfield Wastewater Division. Areas not served by these providers are generally served by septic tanks or wastewater plants well beyond proposed alignments.

Los Angeles to San Diego via Inland Empire

This region of southern California includes the eastern portion of the Los Angeles basin from downtown Los Angeles east to the Riverside and San Bernardino areas and south to San Diego generally along the I-215 and I-15 corridors.

- Electrical Facilities—Providers include LADWP, SCE, and San Diego Gas and Electric Company (SDG&E).
- Natural Gas Facilities—Provided by Sempra Energy Company through its subsidiaries of SCG and SDG&E.

- Wastewater Treatment and Water—Provided by more than 13 cities and special districts.

Los Angeles to San Diego via Orange County

This region includes the western portion of the Los Angeles basin between downtown Los Angeles and Los Angeles International Airport and the coastal areas of southern California between Los Angeles and San Diego, generally following the existing Los Angeles to San Diego via Orange County (LOSSAN) rail corridor.

- Electrical Facilities—Providers include LADWP, SCE, and Sempra Energy Company/SDG&E.
- Natural Gas Facilities—Provided by SCG and three wholesale utility customers, including SDG&E, Southwest Gas Corporation, and City of Long Beach Energy Department.
- Wastewater Treatment—Provided primarily by San Diego Metropolitan Wastewater District, Encina Wastewater Authority, San Elijo Joint Powers Authority, U.S. Marine Corps, and South Orange Wastewater Authority.

3.10.3 Environmental Consequences

A. EXISTING CONDITIONS COMPARED TO NO PROJECT ALTERNATIVE

The existing conditions assume the continued operation of the transportation and public utilities infrastructure described above. The No Project Alternative assumes that, in addition to existing conditions, additional transportation and utility improvements will be developed and operational by 2020. The transportation improvements include projects that are programmed or funded to 2020 (as described in Chapter 2).

It was not possible as part of this study to identify or quantify the utility improvements expected to occur by 2020. Rather, it is assumed that utility development will occur to meet projected demand and growth characteristics near the alignments of the proposed alternatives. For existing transportation facilities, conflicts with electrical transmission lines, natural gas pipelines, oil pipelines, wastewater and water utilities, and other utilities have previously been addressed and few additional or increased impacts are expected from the future transportation improvement included in the No Project Alternative. In addition, it is assumed that measures would be taken to avoid these potential conflicts to the extent feasible and practical, as well as to greatly limit any potential additional costs or disruption of service. It is common practice to coordinate onsite with utility representatives during construction in the vicinity of critical infrastructure such as high-voltage overhead/underground transmission lines, high-pressure gas pipelines, or aqueduct canals. Also, future transportation or utility improvements would be expected to be analyzed in a project-level environmental document, which would incorporate feasible measures to mitigate potentially significant adverse environmental impacts.

Based on the above assumptions, the existing conditions of the No Project Alternative are used to provide the baseline for analysis of potential conflicts with utilities.

B. NO PROJECT ALTERNATIVE COMPARED TO MODAL AND HIGH-SPEED TRAIN ALTERNATIVES

Existing conditions from the No Project Alternative provide the baseline condition. Improvements associated with the proposed Modal and HST Alternatives would result in potential impacts in addition to those resulting from the No Project Alternative. With respect to public utilities, the analysis did not show significant differences when comparing the No Project Alternative to the Modal and HST Alternatives, or comparing the Modal and HST Alternatives. As described above, the number of potential utility conflicts under the No Project Alternative was not identified, and existing conditions were used as the baseline for analysis. For the purposes of this analysis, the existing conditions are treated as representative of the No Project Alternative, and the analysis summarizes the relative differences between the existing conditions and Modal and HST Alternatives. Because there are several alignment and station options for the HST Alternative, a range of potential utility conflicts was developed that represents the design options with the least to the greatest number of potential conflicts within a region, as summarized below and in Table 3.10-2.

The most significant difference between the alternatives is the lower number of potential high-impact conflicts (conflicts with fixed facilities such as electrical substations, power plants, and wastewater treatment facilities) under the Modal Alternative. For instance, the HST Alternative would result in up to 20 potential fixed-facility conflicts, compared to 10 under the Modal Alternative. This significant difference is because the Modal Alternative generally is an expansion of an existing facility (i.e., highway widening or airport expansion) where high-impact facilities are not likely to be located. In contrast, greater portions of the HST Alternative would be located in undeveloped corridors where high-impact facilities are more likely to be located; however, the undeveloped corridors offer greater potential for avoidance through alignment changes. Another significant finding is the relatively high number of total potential conflicts for both the Modal (up to 384) and HST (as many as 323) Alternatives in the Sacramento to Bakersfield region compared to other regions. This is a result of two major factors.

- The region includes the longest Modal and HST alignments compared to the other regions.
- The Modal and HST alignments pass through developed urban and agricultural areas where there are heavy concentrations of utilities, compared to other more remote regions, such as mountain crossings, where utilities are limited.

Table 3.10-2
Summary of Potential Public Utilities Conflicts for Alternatives[a]

Region	Electrical Transmission Lines	Electrical Sub- or Power Stations	Natural Gas Pipelines	Wastewater Treatment Pipelines[b]	Wastewater Treatment Plants	Regional Totals
Modal Alternative						
Bay Area to Merced	8	3	80	N/A	0	91
Sacramento to Bakersfield	252	3	128	N/A	1	384
Bakersfield to Los Angeles	57	2	128	2	0	189
Los Angeles to San Diego via Inland Empire	33	1	70	21	0	125
Los Angeles to San Diego via Orange County (HST corridor equivalent)	14	0	30	0	0	44
Los Angeles to San Diego via Orange County (conventional rail corridor equivalent)	26	0	45	4	0	75
Modal System-wide Totals[c]	**364**	**9**	**436**	**23**	**1**	**833**
High-Speed Train Alternative[c]						
Bay Area to Merced	3–4	1–2	51–67	N/A	0–0	55–73
Sacramento to Bakersfield	105–227	1–5	45–89	N/A	0–2	151–323

Bakersfield to Los Angeles	22–47	1–1	57–138	0–3	0–1	80–190
Los Angeles to San Diego via Inland Empire	29–29	2–9	61–64	37–51	0–0	129–153
Los Angeles to Orange County	22–25	1–1	73–77	0–0	0–0	96–103
HST System-wide Totals	**181–332**	**6–18**	**287–435**	**37–54**	**0–3**	**511–842**

[a] It is not possible to quantify the utility impacts associated with the No Project Alternative. The existing conditions are assumed to be representative of the future No Project Alternative.

[b] For Bay Area to Merced and Sacramento to Bakersfield regions, the total number of potential wastewater pipeline conflicts was not provided.

[c] The number of potential conflicts associated with the HST Alternative is provided as a range of potential conflicts. For each region, the HST Alternative generally includes various design options within each segment of the region. These routes serve only to provide a reasonable range of impacts for comparative purposes and do not represent any selection of a preferred option.

3.10.4 Comparison of Alternatives by Region

The key findings of the utilities analysis by region and alignment options are summarized below. For a complete summary of all utility conflicts by region see Table 3.10-B-1 in Appendix 3.10-B.

A. BAY AREA TO MERCED

Modal Alternative

Within the five segments of the region there would be a total of 11 potential conflicts with electrical utility facilities, of which three are fixed facilities. The Merced to San Jose segment includes two electrical power facilities within the study area: PG&E's Evergreen Substation and Calpine's Gilroy power plant. In addition, the study area for the San Jose to San Francisco segment includes PG&E's San Jose B Substation. There are potential conflicts with natural gas pipelines for a total of 80 potential conflicts in all segments; the San Jose to Oakland segment would have the highest number of potential conflicts (22). No potential conflicts with wastewater treatment plants were identified. There is a potential for conflicts with wastewater pipelines, although no quantifiable data about the total number of potential conflicts were available.

High-Speed Train Alternative

Within the San Jose to Oakland segment, there are two potential high-impact conflicts: the PG&E San Jose B Substation and Santa Clara Power Plant. The San Jose B Substation would potentially conflict with the I-880 alignment option, while the Santa Clara Power Plant would potentially conflict with the Mulford alignment option. The largest number of potential conflicts associated with the HST Alternative would be with natural gas pipelines. There are no potential conflicts with wastewater treatment plants.

High-Speed Train Alignment Option Comparison

The two alignment options for the segment between Oakland and San Jose each would potentially impact an electrical substation and have a similar number of conflicts with natural pipelines, 20 for the Hayward Alignment/I-880 option and 18 for the Hayward/Niles/Mulford option. No other alignment options within the region would result in potential impacts on a fixed facility. From San Jose to Merced, the Pacheco Pass options would each result in more natural gas pipeline conflicts (23) than the three Diablo Range direct tunnel options (9). Each alignment option would potentially conflict with three electrical transmission lines. Along the existing Caltrain corridor between San Francisco and San Jose, the only potential for conflict would be with the 24 natural gas pipelines within the study area.

B. SACRAMENTO TO BAKERSFIELD

Modal Alternative

Of the 384 total potential conflicts, 255 (66%) are electrical facilities, three of which are high-impact substations. The proposed widening of SR-99 would potentially conflict with two electrical substations in the Sacramento to Stockton segment and one in the Modesto to Merced segment. There are a total of 128 potential conflicts with natural gas pipelines. There is the potential for impacts on the Atwater Wastewater Treatment Plant, which lies adjacent to SR-99 in the Modesto to Merced segment and could be affected by the widening of the highway. There is a potential for conflicts with wastewater pipelines, although data about the total number of potential conflicts have not been gathered.

High-Speed Train Alternative

Within three of the six segments, there is a potential for conflict with either an electrical substation or power station, or a wastewater treatment plant. All the alignment options within the Sacramento to Stockton segment would potentially conflict with electrical substations. Within the Modesto to Merced segment, only one Union Pacific Railroad (UPRR) alignment option would potentially conflict with the Ceres Water Reclamation Facility. All but two alignment options in the Tulare to Bakersfield segment would potentially conflict with either an electrical substation or the Cross Valley Canal Wastewater Treatment Plant.

High-Speed Train Alignment Option Comparison

Within the Sacramento to Stockton segment, the number of potential impacts on fixed facilities is equal for the UPRR and Central California Traction (CCT) alignment options. Depending on the option, the potential fixed-facility conflicts associated with the UPRR and CCT alignment options ranges from one to three. The difference between the alignment options is the addition of another potential electrical substation conflict associated with the UPRR option maintenance facility.

There are no impacts with fixed facilities within the Stockton to Modesto segment. In this segment the UPRR alignment option has more total potential conflicts with electrical transmission lines and natural gas pipelines than the Burlington Northern Santa Fe (BNSF) alignment option.

From Modesto to Merced, one of the connectors to the UPRR alignment option would potentially conflict with a wastewater treatment plant, but the BNSF alignment option would have no major conflicts.

From Merced to Tulare there would be no impacts on fixed facilities for any of the UPRR or BNSF alignment options, and total potential conflicts would be similar for all alignment options.

In the Tulare to Bakersfield segment, each UPRR alignment option would potentially impact an electrical substation, and the majority would also potentially impact a wastewater treatment plant. The BNSF alignment option would not impact an electrical substation, but would potentially impact a wastewater treatment plant.

In general, the alignment option with the greatest number of potential high-impact conflicts and total utility conflicts follows the UPRR alignment. The difference between the alignment options with the greatest potential conflicts and the least potential conflicts is six fixed facilities, and 100 transmission line and natural gas pipeline conflicts. This represents a substantial difference and should be considered a primary discriminator between the alignment options.

C. BAKERSFIELD TO LOS ANGELES

Modal Alternative

There are 57 potential conflicts with electrical facilities within the study area. This includes potential conflicts in all project segments, with the exception of SR-58/14 from SR-99 to Palmdale (because there is no highway widening in that area). Within the I-5: Burbank to Los Angeles Union Station (LAUS) segment, there is the potential for conflict with the McNeil Substation and a 42-MW electrical power plant in the City of Burbank. Of the total 128 potential conflicts with natural gas pipelines, the I-5 between SR-14 and SR-99 segment has the greatest number (88). There are limited potential conflicts with wastewater facilities, with the exception of I-5: SR-99 to SR-14 segment where there are two potential conflicts with a major sewage pipeline.

High-Speed Train Alternative

In the Bakersfield to Los Angeles region, there is the potential for two high-impact conflicts. The SR-58 corridor alignment option in the Bakersfield to Sylmar segment would traverse a portion of the Lancaster Water Reclamation Plant, while the Burbank Metrolink/Media City in the Sylmar to downtown Burbank segment would potentially conflict with the McNeil Substation. All alignment options would potentially conflict with the McNeil Substation since it is part of the only option through the Sylmar to downtown Burbank segment.

High-Speed Train Alignment Option Comparison

From Bakersfield to Sylmar, only the SR-58 corridor alignment option would potentially impact a fixed facility, the Lancaster Water Reclamation Plant. Among the alignment options in the segment there is a wide range of total potential conflicts with utility infrastructure. The SR-58/Soledad Canyon corridor option would have the fewest overall utility conflicts, while the I-5 Tehachapi corridor option would have the most conflicts.

Within the Sylmar to downtown Burbank segment, the majority of potential conflicts are associated with the station options, including one potential impact on an electrical substation as part of the Burbank Metrolink/Media City. The MTA/Metrolink alignment option has two potential conflicts with natural gas lines, while the Combined I-5/Metrolink option has one potential conflict with natural gas lines.

There are no impacts on fixed facilities in the downtown Burbank to Los Angeles segment. There are no substantial differences in the total number of potential conflicts among the various alignment options.

D. LOS ANGELES TO SAN DIEGO VIA INLAND EMPIRE

Modal Alternative

Under the Modal Alternative, the segment with greatest number of potential impacts is the LAUS to March Air Reserve Base. This segment traverses the most developed area of the region and contains the most utility infrastructure. There are a total of 25 potential conflicts with electrical facilities within the segment, including one potential conflict with SCE's Vista Substation. There are 70 potential conflicts with natural gas lines, with equal distribution among all segments. There are 21 potential conflicts with wastewater treatment facilities, of which 18 are located in the Los Angeles to March ARB segment. Utility conflicts are not anticipated at either the Orange or San Diego airport.

High-Speed Train Alternative

Within each segment of the Los Angeles to San Diego via Inland Empire region there would be a potential conflict with an electrical substation or power plant. All alignment options in the Los Angeles to March ARB segment and March ARB to Mira Mesa segment would potentially conflict with one or more electrical power stations. In the Mira Mesa to San Diego segment, two of the three alignment options (both I-15 to the coast alignment options) would potentially conflict with a power station. There would be no potential conflicts with any wastewater treatment plants.

High-Speed Train Alignment Option Comparison
Each alignment option in the Los Angeles to San Diego via Inland Empire region, except the I-15 to Qualcomm Stadium option, would potentially impact fixed electrical facilities. The UPRR Riverside Line to San Bernardino option has the greatest potential for impacts, with seven conflicts with electrical substations. Both the UPRR Colton Line to San Bernardino and UPRR Riverside/UPRR Colton Line options would potentially impact four electrical substations.

The fourth alignment option in the Los Angeles to March ARB segment is the UPRR Colton Line, which would potentially impact one electrical substation. Additionally, each of the alignment options in this segment would result in similar numbers of conflicts with electrical transmission lines, natural gas pipelines, and wastewater pipelines.

Each alignment option in the March ARB to Mira Mesa segment would potentially impact one fixed electrical facility and have similar numbers of conflicts with other public utilities infrastructure.

From Mira Mesa to San Diego, each I-15 to the coast alignment option would potentially impact one fixed electrical facility, while the I-15 to Qualcomm Stadium would not impact any fixed facilities and have relatively few potential conflicts with other public utility infrastructure (four natural gas pipelines and one wastewater treatment pipeline).

E. LOS ANGELES TO SAN DIEGO VIA ORANGE COUNTY

Modal Alternative
There are 26 locations in which the corridor is crossed by 230-kV transmission lines. No electrical substations or power plants were identified within the 100-ft (30-m) study area of I-5. High-pressure natural gas pipelines cross the I-5 corridor in 45 locations. Water treatment facilities crossing the I-5 corridor include two treated wastewater ocean outfalls in the Camp Pendleton segment and two major sewer trunk lines, one in the I-5/805 to SR-52 segment and another in the SR-52 to Santa Fe Depot segment.

High-Speed Train Alternative
There would be no impacts on fixed facilities in the LAUS to LAX alignment option. The potential conflicts for this option include six electrical transmission lines and 41 natural gas pipelines. Each alignment option from LAUS to Irvine would potentially impact an electrical substation. The LOSSAN option would result in slightly more potential conflicts with other utility infrastructure (49 conflicts) than the UPRR Santa Ana Branch option (44 conflicts). There are no impacts on wastewater facilities within the HSR corridor.

3.10.5 Design Practices

The public utilities impact analysis is programmatic and addresses only representative utilities; it does not address all utilities and does not address local details. Project-level analysis would address all utilities and local issues once the alignments are more defined. The Authority plans to avoid these potential conflicts to the extent feasible and practical, as well as to greatly limit any potential additional costs or disruption. It is common practice to coordinate onsite with utility representatives during construction in the vicinity of critical infrastructure such as high-voltage overhead/underground transmission lines, high-pressure gas pipelines, or aqueduct canals. Also, future transportation or utility improvements would be analyzed at the project-level environmental review along with feasible measures to mitigate potentially significant adverse environmental impacts.

3.10.6 Mitigation Strategies and CEQA Significance Conclusions

Proposed general mitigation strategies for potential utility conflicts should first focus on avoidance of the potential conflicts. If such conflicts are unavoidable, the next strategy should focus on reducing and minimizing the potential impact. The mitigation strategies are similar for all regions and would be refined during subsequent project-specific review.

For large utilities, such as wastewater treatment facilities, electrical substations, and pipelines, the strategy would be first to avoid crossing or using any of the utility right-of-way or facility footprint as the project-specific review proceeds and as engineering designs are refined. Avoidance opportunities should include consideration of modifying both the horizontal and vertical profiles of the proposed transportation improvements.

If avoidance is not feasible, and adjustment of alignments has not removed potential conflict, then in close consultation and coordination with the utility owner, relocation/reconstruction/restoration of the utility should be considered as a second mitigation strategy. This type of mitigation could include combining several utilities into a single utility corridor, or relocation or reconstruction. Where feasible and cost-effective, consolidating several utilities, primarily underground electrical and communications utilities, into one conduit should be considered during utility relocation planning.

Potential strategies to avoid and/or mitigate potential utility conflicts associated with the HST Alternative include but are not limited to the following:

- Make adjustments to the HST alignments and profiles to avoid major utility lines or facilities.
- Relocate transmission lines or substations.
- The co-lead agencies would comply with the requirements of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 in the acquisition of all property necessary for the proposed HST system.
- During final design, the Authority would consult with each utility provider/owner to avoid or reduce potential impacts on existing and planned utilities through design refinements. Should impacts be unavoidable, all affected facilities would be relocated or protected in place prior to, during or after construction, as appropriate, and in accordance with the methods and designs approved by the affected utility provider/owner.

Based on the analysis above, and considering the CEQA Appendix G thresholds of significance for public utilities and service systems, the HST system alternative would not be expected to result in a significant effect on utilities and utility services when viewed on a system-wide basis. The proposed location of the HST system largely within existing transportation corridors reduces the systemwide potential to affect utility operations. In locations where a proposed HST alignment would intersect or be in close proximity to existing utility pipelines or facilities, design modifications and avoidance strategies would be applied to avoid and to limit impacts to utilities. Opportunities for utility relocation and coordination would also help avoid utility impacts. Design practices and mitigation strategies would be applied also to avoid even temporary curtailment of services during construction. Because the proposed HST system, as analyzed in Chapter 5, would not contribute significantly to statewide population growth, it is not expected to result in a significant increase in demand for public utility services, and thus, viewed on a system-wide basis it would have a less-than-significant effect on these services.

The above mitigation strategies are expected to reduce impacts of the HST system alternative to utilities to a less-than-significant level. Additional environmental assessment will allow a more precise evaluation in the second-tier of environmental analyses.

3.10.7 Subsequent Analysis

As previously mentioned, the public utilities impact analysis is programmatic and addresses only representative utilities; it does not address all utilities and does not address local details. Project-level analysis would address all utilities and local issues once the alignments are more defined. Project-level environmental documentation and subsequent planning documents should include more detailed information on the following utilities.

- Water supply lines.
- Wastewater conveyance lines.
- Wastewater and water pump stations.
- Storm drains.
- Fiber-optic lines.
- Telecommunication lines.
- Other utilities, and pipelines likely to be crossed or conflict with the various alternative alignments, including liquid petroleum, crude oil, etc.

3.11 HAZARDOUS MATERIALS AND WASTES

This section identifies the potential for impacts on areas that may be contaminated with hazardous materials and/or wastes for the No Project, Modal, and High-Speed Train (HST) Alternatives within the five project regions. According to Title 22 C.C.R. § 66261, waste is considered *hazardous* if it exhibits at least one of the four characteristics of ignitability, corrosivity, reactivity, or toxicity, or if it is a "listed waste." Waste can be liquid, semi-solid, or gaseous. A potential hazardous waste impact is any potential conflict between an alignment, station, or airport facility and a known contaminated site, including crossings of a known contaminated site regardless of depth or height. The section focuses on contamination at sites on the National Priorities List (NPL)/Superfund, California's high-priority Annual Work Plan (AWP) sites, and solid waste landfill (SWLF) sites.

3.11.1 Regulatory Requirements and Methods of Evaluation

A. REGULATORY REQUIREMENTS

Hazardous materials and waste sites, including their use and remediation, are regulated by a number of federal laws, including the Resource Conservation and Recovery Act and the Comprehensive Environmental Response and Liability Act (CERCLA).

California's hazardous materials regulations for the discovery of hazardous substances in the subsurface during construction, and the disposal of hazardous materials and cleanup of the hazards area incorporate most federal hazardous materials regulations. California's statutes and regulations on hazardous materials are contained in Health and Safety Code Section 25130 *et seq*. and Title 22 C.C.R., which contains regulations adopted and administered by the California Department of Toxic Substances Control (DTSC). California regulations require that hazardous waste be managed according to applicable regulations that include worker operational safety procedures as identified in Title 8 C.C.R.; handling, storage, and exposure requirements; transportation and disposal requirements under a uniform hazardous waste manifest; and documentation procedures. In California, waste disposal facilities are classified in three categories: Class I, Class II, and Class III. A Class I disposal facility may accept federal and California hazardous waste. Class II and Class III facilities are only permitted to accept non-hazardous waste at facility specific acceptance threshold levels established by the Regional Water Quality Control Board (RWQCB), the permitting agency.

Additional federal and state regulations address worker exposure to safety and health hazards. The federal regulations are identified in Title 29 C.F.R., and the state regulations are in Title 8 C.C.R. The federal and California Occupational Safety and Health Administrations are the primary agencies responsible for enforcing these regulations.

B. METHOD OF EVALUATION OF IMPACTS

Identification of Hazardous Sites

Impacts on hazardous waste and/or material sites are an important consideration in the development of any major transportation improvement project. Remediation of such sites can dramatically increase the overall cost of a project. It is important to know early in the environmental analysis process where potential conflicts with these sites may occur, so that proper planning can be done to avoid these locations where possible. At this program level of analysis, available databases and information regarding the extent and nature of known hazardous materials/hazardous waste sites were reviewed. The following databases were consulted for information on potential hazardous materials risks.

- Federal National Priorities List/Superfund: This U.S. Environmental Protection Agency-developed database lists sites that pose an immediate public health hazard, and where an immediate response to the hazard is necessary. These listings are also found in the CERCLA database, also known as CERCLIS (Title 42 U.S.C. Chapter 103).
- State Priority List: Sites listed in this DTSC and RWQCB database are priority sites that were compiled from AWP and CAL-SITE databases, and sites where Preliminary Endangerment Assessments were conducted by the California Environmental Protection Agency (CEPA). The AWP database lists contaminated sites authorized for cleanup under the Bond Expenditure Plan developed by the California Department of Health Services as a site-specific expenditure plan to support appropriation of Hazardous Substance Cleanup Bond Act funds.
- State of California Solid Waste Landfills: The landfill sites listed in this database generally have been identified by the state as accepting solid wastes. This database includes open, closed, and inactive solid waste disposal facilities and transfer stations pursuant to the Solid Waste Management and Resource Recovery Act of 1972 and is maintained by the California Integrated Waste Management Board. The locations of the disposal facilities are primarily identified through permit applications and local enforcement agencies.

Methods of Analysis

The hazardous materials and wastes analysis for this Program EIR/EIS entailed a qualitative comparison of potential impacts on humans and the natural environment from exposure to hazardous materials or wastes that could result from proximity to or potential disturbance of sites containing these materials due to the No Project Alternative, the Modal Alternative, or the proposed HST Alternative. As described above, the analysis was based on the results of a database search (Environmental Data Resources 2003) for a study area that included the potential HST and Modal alignment corridors as well as proposed station locations and existing airports, as described below in Section 3.11.2. For this program-level broad analysis of potential impacts related to known priority hazards sites, the analysis was limited to hazardous materials sites and hazardous waste sites listed on the NPL, SPL, and SWLF databases. Other types of sites, such as sites with leaking underground storage tanks (LUSTs), would be considered in a subsequent phase of analysis, when site-specific analysis could be tied to more detailed alignment plans and profiles. No site-specific investigations were conducted for this analysis. Because of the large area covered, such analyses would not be cost-effective at this program-level analysis.

Potential impacts of the Modal and HST Alternatives were compared to conditions under the No Project Alternative. This assessment assumed that impacts related to hazardous materials/hazardous waste exposure could occur both during project construction and during project operation. It was based on the anticipated difference between No Project conditions and conditions under the Modal and HST Alternatives, in terms of the estimated area of the proposed improvements described in Chapter 2, *Alternatives*, which guided the identification of study area boundaries. Particular attention was paid to the extent of improvements that would occur outside existing rights-of-way. This analysis focused on the number of identified NPL, SPL, and SWLF sites within the study area. The program-level comparison of alternatives in this section assesses the relative degree to which known hazardous material and waste sites could constrain the alternatives by requiring costly disposal conditions and site cleanup and remediation. The number of sites gives some indication of an overall level of potential impact; more sites generally imply more potential impact. In this comparative analysis, each type of listing (NPL, SPL, and SWLF) was given equal weight. The program-level analysis does not include a detailed assessment of the nature or extent of any hazardous materials or wastes that may be present at identified sites, or the degree or specific nature of potential impacts under the various alternatives. The analysis and identification of potential hazards within the study area of alternative corridors and alignments is useful in comparing alternatives and in identifying areas where avoidance may be possible in subsequent project-level review.

3.11.2 Affected Environment

A. STUDY AREA DEFINED

The Modal and HST Alternatives would result in substantial improvements to existing highway, aviation, and rail infrastructure within or adjacent to existing rights-of-way, in addition to the No Project transportation improvements. Therefore, the study area for the presence of hazardous materials and wastes includes existing transportation corridors, new HST corridors, and areas where passenger stations, airport expansions, and HST storage and maintenance facilities are being considered. The study area consisted of a 500 ft-wide (152 mm-wide) (250 ft [76 m] on either side of the centerline or the facility) corridor along each rail and highway alignment identified for the Modal and HST Alternatives, and a 250-ft (76-m) radius around each airport and station facility. The study area boundaries were based on the distance within which a hazardous material or waste site could impact the possible location of a transportation improvement under the Modal or HST Alternative.

B. HAZARDOUS MATERIALS AND WASTE SITES BY REGION

Most of the hazardous materials and hazardous waste sites in the study area are relatively minor in extent and could be effectively mitigated through typical design and construction practices. Fewer major sites are known to be located in the vicinity of the proposed HST system alignment options than near existing highway alignments. Figure 3.11-1 shows the general locations of hazardous materials and hazardous waste sites identified through the database search. Additional information on the results of the database search is presented in Appendix 3.11-A and in the hazardous materials and hazardous wastes technical evaluation documents prepared for each region (Environmental Data Resources 2003).

3.11.3 Environmental Consequences and Comparison of Alternatives by Region

The potential severity of impacts from hazardous material or waste releases on the construction, operations, and maintenance of the proposed alternatives would depend on two factors: the nature and severity of contamination, and the construction and operations/maintenance activities that are likely to occur near the sites. The sites that pose the greatest concern are those with soil or groundwater contamination within or adjacent to the right-of-way, and those with groundwater contamination near areas where excavation down to groundwater would be necessary. For example, dewatering during excavation, trenching, or tunneling could alter local subsurface hydraulic gradients and draw groundwater contamination into excavated areas, trenches, or tunnels. In addition, fuel or chemical vapors could move through the vadose zone[1] to excavated areas (during construction), or to underground structures associated with the rail line such as vaults and manholes (during project operation).

A. EXISTING CONDITIONS COMPARED TO NO PROJECT ALTERNATIVE

The description of existing conditions in the study area was based on the known hazardous materials sites in the vicinity of the transportation infrastructure that exists in 2003. The No Project Alternative would incorporate local, state, and interstate transportation system improvements designated in existing plans and programs. This analysis assumed that no additional hazardous material or waste impacts would occur beyond those already addressed or those that would be addressed in the environmental documents for those improvement projects, and that any such impacts would largely

[1] The *vadose zone* comprises the region between the land surface and underlying groundwater aquifers and is the geologic zone through which pollutants and contaminants travel prior to entering groundwater (INEEL National Vadose Zone Project 2002).

be mitigated as part of those projects. For the purpose of this analysis, existing hazardous materials sites and hazardous waste sites identified in the available databases were treated as the baseline for comparison. While the future conditions for the No Project Alternative may result in some additional hazardous materials or waste impacts, they cannot be predicted or estimated for purposes of this program-level analysis. Similarly, it can be presumed that during the next 17 years some of the existing hazardous waste sites would be cleaned up or remediated as part of CEPA and RWQCB efforts.

Projects included under the No Project Alternative would be completed before construction of the Modal or HST Alternative. Construction associated with the No Project Alternative, compared to existing conditions, would vary depending on the region being analyzed. As identified in the hazardous materials and hazardous wastes technical evaluation documents prepared for each region (Environmental Data Resources 2003), in the Bay Area to Merced and the Los Angeles to San Diego via Inland Empire regions, the difference between existing conditions and the No Project Alternative would likely be greater than that between the No Project Alternative and the Modal or HST Alternative. The opposite is expected to be the case in the Sacramento to Bakersfield, Bakersfield to Los Angeles, and Los Angeles to San Diego via Orange County (LOSSAN) regions. This assumption and assessment of potential impacts is based on the estimated land area of the anticipated improvements and particularly on the amount of improvements that would likely occur outside of existing right-of-way. This assumption does not take into account the dollar value or complexity of the anticipated improvements.

B. NO PROJECT ALTERNATIVE COMPARED TO MODAL AND HIGH-SPEED TRAIN ALTERNATIVES

As described above, the No Project Alternative was used as a proxy for the baseline 2020 condition; the impact from any improvements associated with the Modal or HST Alternatives would be in addition to the impacts from the 2020 No Project Alternative. Table 3.11.3-1 compares the number of potential hazardous material and waste sites identified under the Modal and HST Alternatives, based on more detailed information presented in Appendix 3.11-A.[2]

As shown in Table 3.11.3-1, the number of sites identified for the HST Alternative varies widely depending on which alignment and station options are selected, ranging from 31 (less than under the Modal Alternative) to 75 (more than twice the number of sites identified under the Modal Alternative). The numbers of sites identified for the HST Alternative in the Bakersfield to Los Angeles; Los Angeles to San Diego via Inland Empire; and LOSSAN, including Los Angeles Union Station to Los Angeles International Airport segments are greater for any alignment option than those identified for the Modal Alternative. The Bay Area to Merced and Sacramento to Bakersfield segments are the only regions in which fewer sites were identified for at least one HST Alternative alignment than for the Modal Alternative, probably because the HST Alternative alignment, depending on alignment option, would follow a route with fewer SWLFs than the Modal Alternative.

Assuming that a larger number of identified hazardous materials and hazardous waste sites increases the potential for hazardous materials and hazardous waste impacts, under the HST Alternative the extent of cleanup or remediation required depends on the alignment and station options selected—and, depending on the route and station locations, the HST Alternative could have either a greater or a lesser potential for such impacts than the Modal Alternative. The extent of cleanup or remediation would translate into additional costs for construction, which could make a major difference in practicality or feasibility of an alternative. As described above, this analysis was limited to searches

[2] Appendix 3.11-A shows the number of identified NPL, SPL, and SWLF sites associated with the HST and Modal Alternatives. For the Modal Alternative, the number of sites includes those identified along the roadway alignments and around airport improvements. For the HST Alternative, the number of sites includes those identified along the alignment options, stations, and storage and maintenance facilities.

of standard databases listing known sites and did not incorporate information on other smaller sites that could contribute to risk on a local basis and would be studied at the project-specific level, if the proposed HST system is pursued. In addition, because neither site-specific investigations nor onsite fieldwork was performed, little or no information is available about the nature and severity of contamination at the sites identified, or the schedule or program for cleanup, if any, so the comparison above represents a "site-count" approximation and may not fully divulge potential risk levels. Finally, much of both the Modal and HST Alternative alignments would be within existing right-of-way, and these alignments have a land-use history under which additional unknown contamination (e.g., spills or accidental releases) would be a possibility. Consequently, although no unavoidable hazardous materials and hazardous waste impacts are expected under either the Modal Alternative or HST Alternative, hazardous materials and hazardous waste information available at the program level is not sufficient to distinguish the two alternatives.

Table 3.11.3-1
Potential Hazardous Material and Waste Sites Comparison Modal and High-Speed Train Alternatives

Region	Modal Alternative	HST Alternative	
		Fewest Identified Sites	Most Identified Sites
Bay Area to Merced	5	3	11
Sacramento to Bakersfield	16	8	24
Bakersfield to Los Angeles	8	13	23
Los Angeles to San Diego via Inland Empire	4	7	14
Los Angeles to San Diego via Orange County	2	5	5
Total Sites*	33	31	72

* Totals presented do not include the identified LOSSAN sites because this segment is not a part of the HST Alternative defined for the representative demand.

Source: Environmental Data Resources 2003.

3.11.4 Design Practices

At this programmatic level of study it is not possible to identify specific hazardous material impacts, determine the nature and severity of contamination, or the construction and operations/maintenance activities that are likely to occur near specific sites. However, the Authority is committed to avoiding and minimizing potential impacts through design refinement at the project level as well as the use of best practices to avoid potential impacts during construction.

3.11.5 Mitigation Strategies and CEQA Significance Conclusions

Mitigation for impacts related to hazardous materials and/or hazardous wastes depends on detailed site-specific investigations (environmental site assessments) that have not been performed at this programmatic level of analysis. More detailed analysis and specific mitigation measures would be included in subsequent project-level analysis. Mitigation strategies could include realignment of the HST corridor or relocation of associated features such as stations to avoid an identified site, and remediation of identified hazardous material/waste contamination.

In addition, potential mitigation strategies would include, but are not limited to, the following:

- Investigate soils for contamination and prepare environmental site assessments (ESA) when necessary.

- Prior to demolition of buildings for project construction, survey for lead-based paint and asbestos-containing materials.
- Acquire necessary permits if ground dewatering is required
- When indicated by project level ESA's, perform a Phase II ESA (e.g., hydrogeologic investigation) to identify specific mitigation measures. Perform Phase II ESA's in conformance with the ASTM Standards Related to the Phase II Environmental Site Assessment Process (E1903-01)
- Prepare a Site Management Program/Contingency Plan (SMP/CP) prior to construction to address known and potential hazardous material issues SMP/CP including:
  - Measures to address management of contaminated soil and groundwater
  - Site-specific Health and Safety Plan (HASP) including measures to protect construction workers and general public
  - Procedures to protect workers and the general public in the event that unknown contamination or buried hazards are encountered

Based on the analysis above, and considering CEQA Appendix G thresholds of significance and the standards described in paragraph 3.11 for hazardous materials and hazardous wastes, the proposed HST alternative would have a potentially less than significant effect on hazardous materials and hazardous waste when viewed on a systemwide basis. At this programmatic level of review, it is not possible to identify specific hazardous material impacts, or the nature and severity of contamination at specific sites. However, the Co-lead agencies' commitment of using design practices to minimize impacts, and the use of best practices and mitigation strategies for remediation of hazardous sites, are expected to substantially lessen or avoid impacts to hazardous materials and wastes. With the second-tier, project-level review, specific impacts to sites with hazardous materials will be identified, and mitigation measures based on these mitigation strategies will be applied on a site-specific basis. Additional environmental assessment will allow more precise evaluation in the second-tier, project-level environmental analyses.

3.11.6 Subsequent Analysis

Specific studies that would be required for project-level environmental documentation include environmental site assessments, which would study the identified hazardous materials and hazardous waste sites in more detail to evaluate the nature and level of contamination and allow thorough analysis of potential impacts in accordance with applicable regulatory requirements. Tasks to be performed as part of the project-level environmental site assessment would be expected to include the following.

- Environmental database search. This would include additional databases (e.g., Cortese list, LUST list, other sites, etc.).
- Review of historical land use for all alignment options or corridor alternatives carried forward for detailed analysis.
- Site reconnaissance.
- Review of agency records and agency consultation.
- Data analysis and report preparation.

3.12 CULTURAL AND PALEONTOLOGICAL RESOURCES

Cultural resources include prehistoric archaeological sites, historic archaeological sites, traditional cultural properties, and historic structures. *Paleontological resources* are resources in the fossil record, such as prehistoric remains and other evidence of past life. This section discusses the applicable federal and state laws and regulations that protect cultural and paleontological resources, including Section 106 of the National Historic Preservation Act (NHPA) and California Public Resources Code Sections 5024.1 and 21084.1, and assesses the potential for the proposed high-speed train (HST) system and alternatives to have impacts on these resources.

3.12.1 Regulatory Requirements and Methods of Evaluation

A. REGULATORY REQUIREMENTS

<u>Cultural Resources</u>

The NHPA (16 U.S.C. § 470 *et seq*.) established a national program to preserve the country's historical and cultural resources. Section 106 of the NHPA requires federal agencies to consider the effects of their actions on historic properties and provide the President's Advisory Council on Historic Preservation an opportunity to comment on a proposed action before it is implemented. Guidelines for implementing the Section 106 process are provided in 36 C.F.R. § 800. Both state and federal guidelines for cultural resources recognize that buildings, structures, objects, districts, and cultural landscapes can be historically significant. The NHPA refers to these significant resources as "historic properties," while under CEQA, such highly sensitive resources are referred to as "historical resources." Adverse changes to historic properties and historical resources caused by an undertaking are described as "adverse effects" under Section 106, and as "adverse changes" or "adverse impacts" under CEQA. Under state law, projects that would cause a substantial adverse change in the historical significance of a historical resource are considered projects that may have a significant impact on the environment for CEQA purposes (see below for NHPA and CEQA discussion. Under NHPA Section 106 (36 C.F.R. § 800.16), an historic property is "any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places" (NRHP). Districts include the property types known as cultural landscapes (historic, rural, designed, etc.). To be eligible for the NRHP these property types must meet at least one of the NRHP significance evaluation criteria (36 C.F.R. § 60.4) to be considered an historic property, and the property must also possess integrity. NRHP historic properties meet one or more of the following evaluation criteria:

- The property is associated with events that have made a significant contribution to the broad patterns of our history (Criterion A).
- The property is associated with the lives of persons significant in our past (Criterion B).
- The property embodies the distinctive characteristics of a type, period, or method of construction; represents the work of a master; possesses high artistic values; or represents a significant and distinguishable entity whose components may lack individual distinction (Criterion C).
- The property has yielded, or may be likely to yield, information important to prehistory or history (Criterion D).

Under CEQA, significant cultural resources are called "historical resources" whether they are of historic or prehistoric age. *Historical resources* are resources that are listed, or eligible for listing, in the California Register of Historical Resources (CRHR), or which are listed in the historical register of a local jurisdiction (county or city). NRHP historic properties located in California are considered to be historical resources for the purposes of CEQA and are also listed in the CRHR (P.R.C. § 5024.1). Generally, a resource should be considered an historical resource for the purposes of CEQA if it has integrity and meets one or more of the criteria for listing in the CRHR (CEQA Guidelines § 15064.5[a][3]). These state criteria are based upon, and are very similar to, federal significance criteria:

- The resource is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage (Criterion 1); or
- The resource is associated with the lives of persons important in California's past (Criterion 2); or
- The resource embodies the distinctive characteristics of a type, period, region, or method of construction; represents the work of an important creative individual; or possesses high artistic values (Criterion 3); or
- The resource has yielded, or may be likely to yield, information important in prehistory or history (Criterion 4).

The NRHP and CRHR criteria are almost identical. Any resource determined eligible for NRHP is also automatically eligible for CRHR. However, the term "historical resources" under CEQA and CRHR is more inclusive since resources listed in local historical surveys that meet Office of Historic Preservation standards are encompassed.

The definition of effect for the purposes of Section 106 of NHPA is contained within 36 CFR § 800: "*Effect* means alteration to the characteristics of a historic property qualifying it for inclusion in or eligibility for the National Register." An adverse effect occurs "when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association… Adverse effects may include reasonably foreseeable effects caused by the undertaking that may occur later in time, be farther removed in distance or be cumulative."[1] Examples of adverse effects may include, but are not limited to: destruction, damage, alteration, or relocation of a historic property, as well as the introduction of elements that diminish the property's integrity, cause neglect of a property, or its transfer out of federal ownership.[2]

Impacts on historical resources listed in or eligible for the CRHR constitute a significant effect on the environment (significant impacts that must be disclosed in a CEQA environmental document) if the impact constitutes a substantial adverse change in the significance of a historical resource (P.R.C. § 21084.1). Similar to the federal definition of adverse effect, a *"substantial adverse change"* to a historical resource under CEQA includes "physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of an historical resource would be materially impaired" (CEQA Guidelines § 15064.5[b][1]). *Material impairment* includes changes to the physical characteristics that make a historical resource eligible for listing in the CRHR such that the resource would no longer be eligible for the CRHR or a local historical register (CEQA Guidelines § 15064.5[b][2]).

Paleontological Resources

The following United States statutes incorporate provisions for the protection of paleontological resources.

[1] 36 CFR 800.5(a)(1).

[2] 36 CFR 800.5(a)(2)(i through vii).

- Federal Antiquities Act of 1906 (16 U.S.C. § 431 *et seq.*): Establishes national monuments and reservation of lands that have historic landmarks, historic and prehistoric structures, and other objects of historic or scientific interest on federal lands. Section 433 prohibits appropriation, excavation, injury, or destruction of any historic or prehistoric ruin or monument, or any object of antiquity on Federal lands only.
- National Environmental Policy Act of 1969 (P.L. 91–190, 83 Stat. 852, 42 U.S.C. §§ 4321–4327): Mandates policies to "preserve important historic, cultural, and natural aspects of our national heritage" (§ 101.b4).

In California, fossil resources are considered a limited, nonrenewable, highly sensitive scientific resource. The following state statutes incorporate provisions for the protection of paleontological resources.

- CEQA (P.R.C. § 21000 *et seq.*): Requires public agencies and private interests to identify the potential adverse impacts and/or environmental consequences of their proposed project(s) to any object or site that is historically or archaeologically significant or significant in the cultural or scientific annals of California (P.R.C. § 5020.1). Under CEQA, archaeological resources are presumed nonunique unless they meet the definition of "unique archaeological resources" (P.R.C. § 21083.2[g]). Under CEQA, an impact on a nonunique archaeological resource is not considered a significant environmental impact. An EIR need not discuss nonunique archaeological resources.
- CEQA Guidelines (14 C.C.R. § 15064.5 [a][3]): Provides that a lead agency may find that "any object, building, structure, site, area, place, record, or manuscript" is historically significant or significant in the "cultural annals of California." The section also provides that, generally, a resource may be considered historically significant if it has yielded or may be likely to yield information important in prehistory. Paleontological resources fall within this broad category and are included in the CEQA checklist under *Cultural Resources*.
- Public Resources Code Section 5097.5: Prohibits excavation or removal of any "vertebrate paleontological site ... or any other archaeological, paleontological or historical feature, situated on public lands, except with the express permission of the public agency having jurisdiction over such lands." *Public lands* include lands owned by or under the jurisdiction of the State of California or any city, county, district, authority, or public corporation, or any agency thereof. This section provides that any unauthorized disturbance or removal of paleontologic, archaeologic, and/or historic materials or sites located on public lands, which violates the section, is a misdemeanor.
- Public Resources Code Section 30244: Requires reasonable mitigation of adverse impacts on paleontological resources resulting from development on public land in the Coastal Zone, as defined in Public Resources Code Section 30103.

B. METHOD OF EVALUATION OF IMPACTS

Archaeological Sites and Traditional Cultural Properties

The FRA initiated consultation with the State Historic Preservation Office (SHPO) under Section 106 of the NHPA in November 2002 with a letter (Appendix 3.12-A) that proposed a phased identification effort for historic properties as provided for in 36 C.F.R. § 800.4 (b)(2). The SHPO concurred with the phased identification and evaluation for compliance with Section 106 in November 2002 (Appendix 3.12-A). The study area for cultural resources is the Area of Potential Effect (APE), which was defined by the FRA in consultation with the SHPO, who concurred by email in January 2003 (Appendix 3.12-A). The SHPO was also consulted about the method of evaluation for this Program EIR/EIS.

Cultural resources studies began with records searches obtained from the appropriate California Historical Resources Information System (CHRIS) Information Centers. The records searches identified the general locations of previously recorded archaeological sites in the APE. The number of known archaeological sites within the APE for each alternative was tabulated and used as an indicator of potential sensitivity for the comparison of the relative degree of potential impacts or effects for each alternative. For this program-level analysis, individual archaeological sites were not evaluated for eligibility. Instead, the archaeological sites identified as a result of the records searches were considered potentially eligible for listing in the CRHR or the NRHP, and the number of archaeological sites per linear mile identified in the APE for each alternative was used as one indicator of the relative degree of potential impacts on cultural resources from construction or operation of that alternative. Impacts on NRHP-eligible archaeological resources include physical destruction or damage. The total number of archaeological sites in the APE for the corridor was divided by the total length of the corridor being evaluated to arrive at an average number of sites (or proportion of sites) per mile. That average was then translated to a qualitative rating of *low*, *medium*, and *high* impacts as follows.

- Low: 0.00–0.25 site per mile for the corridor.
- Medium: 0.26–0.75 site per mile.
- High: 0.76–more than one site per mile.

The cultural resource specialist's knowledge and background of regional prehistory supplemented the records search results. For example, if the cultural resource specialist has previous experience that several sites have been identified along a particular river drainage in the region, but the records search did not yield formally recorded sites in CHRIS within the APE for a particular alternative route, the cultural resource specialist documented the additional information and, based on it, increased the rating for that corridor.

Certain kinds of prehistoric sites and certain kinds of material sites are often regarded by contemporary Native Americans as especially sensitive. These include habitation sites, shell mounds, and burials. If sites with these characteristics were present along the route for an alternative, that route was automatically ranked high for archaeological resources, indicating that the potential sensitivity to impacts from construction disturbance would be greater in that corridor than in a corridor ranked as low or medium.

<u>Historic-era Properties and Historical Resources</u>
The method used in this Program EIR/EIS for evaluating potential effects and impacts to historic-era properties and historical resources began with the same consultation as used for prehistoric resources. The FRA initiated consultation with SHPO under Section106 of the NHPA in November 2002 with a letter (Appendix 3.12-A) that proposed a phased identification effort for historic properties as provided for in 36 C.F.R. § 800.4 (b)(2), and requested the SHPO to comment on the proposed Area of Potential Effect (APE) for cultural resources (prehistoric and historic) for this Program EIR/EIS. The SHPO concurred with the phased identification and evaluation for compliance with Section 106 in November 2002 and the APE by email in January 2003 (Appendix 3.12-A). The SHPO was also consulted about the method used to predict potential effects and impacts for this Program EIR/EIS.

The method used to predict potential effects and impacts of the HST program on historic properties and historical resources is based upon estimating the amount of historic development that occurred along each proposed segment/alignment. These estimates were based upon review of existing documentation, including historical maps, aerial photographs, and local inventories, and the preparers' knowledge of the history of the region. New surveys of historic-period properties/resources were not conducted for this program-level analysis. Instead, the likelihood that a proposed HST route would affect or impact historic properties or historical resources was determined by estimating the linear miles of each alternative that pass through historic development, i.e., buildings, structures, objects, sites, district, and/or landscapes that developed during specific historical time periods (before 1900, 1900 to 1929, and 1930 to 1958). This likelihood, or sensitivity, was calculated by measuring the linear miles of development that occurred during each historic period, so that the various program alternatives could be compared based on the percentage of each route that passed through historic development. The more area along each HST route alternative that developed historically, the more likely it is that there would be historic-era properties/historical resources along the route that could be affected or impacted by the HST program. The percentage of historic development was ultimately expressed as a ranking of *low*, *medium*, or *high* probability of affecting or impacting historic-era properties/resources.

- Low: 0%–25% of the corridor passes through areas of historic development.
- Medium: 26%–75% of the corridor passes through areas of historic development.
- High: 76%–100% of the corridor passes through areas of historic development.

Traditional Cultural Properties and Native American Consultations

The FRA and the Authority initiated consultation with the California Native American Heritage Commission (NAHC) requesting a search of their Sacred Lands file to identify any traditional cultural properties that could be potentially impacted or affected by the project, and requesting lists of Native Americans to contact for the areas that could be affected by the project, as required by 36 C.F.R. § 800.4(1)(4).

Letters were sent to Native Americans on the contact lists provided by the NAHC. The letters provided information about the proposed project alternatives and requested information about any traditional cultural properties that could be affected by the project.

Authority staff met with tribal representatives in a series of three Workshops held during the fall of 2003. The workshops were held on September 9, 2003, at Frazier Park in the Tehachapi Mountains; on September 10, 2003, at the San Luis Recreation Area in Gustine; and on October 9, 2003, at the Temecula Community Center. HST alignment options and potential station locations, potential impacts on cultural resources, the level of detail of the Program EIR/EIS studies, and need for potential subsequent project-specific studies were discussed at each of the workshops.

Native American concerns have also been conveyed to the FRA and the Authority at public hearings or as comments submitted on the EIR/EIS.

Paleontological Resources

Paleontological resources determined to be significant are fossils or assemblages of fossils that are unique, unusual, rare, uncommon, and diagnostically or stratigraphically (layers of the earth's surface) important, and/or those that add to an existing body of knowledge in specific areas—stratigraphically, taxonomically, and/or regionally.

Literature research and institutional records searches or geologic maps and geographic data from the University of California Museum of Paleontology in Berkeley have resulted in the designation of areas within the APE as having *high*, *low*, or *undetermined* paleontologic sensitivity, as follows.

- High: Sedimentary units with a high potential for containing significant nonrenewable paleontological resources. In these cases the sedimentary rock unit contains a high density of recorded vertebrate fossil sites, has produced vertebrate fossil remains within the study area and/or vicinity, and is likely to yield additional remains within the study area.

- Low: The rock unit contains no or very low density of recorded resource localities, has produced little or no fossil remains within the study area and/or vicinity, and is not likely to yield any remains within the study area.
- Undetermined: The rock unit has had limited exposure(s) in the study area and has been little studied, and there are no known recorded paleontological resource localities. However, in other areas, the same or a similar rock unit contains sufficient paleontological resource localities to suggest that exposures to disturbance of the unit within the right-of-way have potential to yield fossil remains.

The number of rock units (formations) having high paleontologic sensitivity and the number of paleontological resource localities recorded within each study area were assessed to provide an accurate interpretation of the overall ranking of high, low, or undetermined potential to impact significant nonrenewable paleontological resources. This evaluation was reached using both the numbers of formations and localities and incorporating professional assessments regarding the significance of recovered resources from exposed rock units and the likelihood of these rock units to contain additional paleontological resources.

3.12.2 Affected Environment

A. STUDY AREA DEFINED: AREA OF POTENTIAL EFFECT

The study area for cultural resources is the APE that was defined in consultation with the SHPO, as noted above in Section 3.21.1.B. The APE for cultural resources at this program level of analysis was developed based on review of the records searches from the CHRIS Information Centers, as well as the cultural resource specialists' knowledge and experience in regional history and prehistory. It is important to note that the APE was specifically designed to aid in the program level analysis, which provides a general comparison of the alternatives without new identification surveys. The size and width of the APE was selected to predict the existence and relative sensitivity of cultural resources in and near the proposed program route alternatives, including prehistoric archaeological sites, historic archaeological sites, traditional cultural properties, and historic buildings, structures, objects, districts, and cultural landscapes. The APE for cultural resources for the proposed HST Alternative is as follows:

- 500 ft (152 m) on each side of the centerline of proposed new rail routes where additional right-of-way could be needed.
- 100 ft (30 m) on each side of the centerline for routes along existing highways and railroads where very little additional right-of-way would be needed.
- 100 ft (30 m) around station locations.

Locations of easements and construction-related facilities, such as equipment staging areas, borrow and disposal areas, access roads, and utilities, have not yet been identified. Locations for these will be identified as part of the construction design program for the alternatives selected for more detailed analysis in the next phase of the project. Thus, these items are not considered in the program Level Tier 1 analysis, but this information will be available for Tier 2 site-specific EIR/EIS's. The APE will be modified to include these items as part of the Tier 2 analysis.

Under the Modal Alternative, the APE for freeway routes and around airports is 100 ft (30 m) beyond the existing freeway right-of-way and 100 ft (30 m) beyond the existing airport property boundary.

The study area for paleontological resources under the HSR Alternative is 100 ft (30 m) on each side of the centerline of proposed rail routes (including station locations), in both nonurban and urban areas. The paleontological APE under the Modal Alternative for freeway routes and around airports is 100 ft (30 m) beyond the existing freeway right-of-way and 100 ft (30 m) beyond the existing airport property boundary. The study area for paleontological resources is limited to the area that would potentially be disturbed by earthwork construction activities.

B. CULTURAL RESOURCE CATEGORIES

The following topics are covered in this section.

- Prehistoric archaeological sites.
- Historic archaeological sites.
- Historic-era properties and historical resources.
- Traditional cultural properties.
- Paleontological resources.

Following are brief descriptions of each cultural resource category.

Prehistoric Archaeological Sites

Prehistoric archaeological sites in California are places where Native Americans lived or carried out activities during the prehistoric period before 1769 AD. Prehistoric sites contain artifacts and subsistence remains, and they may contain human burials. Artifacts are objects made by people and include tools (projectile points, scrapers, and grinding implements, for example), waste products from making flaked stone tools (debitage), and nonutilitarian artifacts (beads, ornaments, ceremonial items, and rock art). Subsistence remains include the inedible portions of foods, such as animal bone and shell, and edible parts that were lost and not consumed, such as charred seeds.

Historic Archaeological Sites

Historic archaeological sites in California are places where human activities were carried out during the historic period between 1769 AD and 50 years ago. Some of these sites may be the result of Native American activities during the historic period, but most are the result of Spanish, Mexican, Asian, African-American or Anglo-American activities. Most historic archaeological sites are places where houses formerly existed and contain ceramic, metal, and glass refuse resulting from the transport, preparation, and consumption of food. Such sites can also contain house foundations and structural remnants, such as windowpane glass, lumber, and nails. Historical archaeological sites can also be nonresidential, resulting from ranching, farming, industrial, and other activities.

Historic-era Properties / Historical Resources

Historic-era properties (NRHP) and *historical resources* (CRHR) are historically significant elements of the built environment that are listed in, or eligible for the NRHP and/or the CRHR. These elements reflect important aspects of local, state, and/or national history and can be buildings, structures, objects, sites, districts, and/or historic cultural landscapes. Examples of the types of historic-era properties or historical resources that are located in and near the APE for the HST program include dwellings, industrial buildings, commercial buildings, downtown districts, farms, canals, rural landscapes, dams, bridges, roads, and other facilities that were built, operated, and previously gained historical significance.

Traditional Cultural Properties

Traditional cultural properties are places associated with the cultural practices or beliefs of a living community that are rooted in that community's history and are important in maintaining the continuing cultural identity of the community. Examples include locations "associated with the traditional beliefs of a Native American group about its origins, its cultural history, or the nature of the world" and locations "where Native American religious practitioners have historically gone, and are known or thought to go today, to perform ceremonial activities in accordance with traditional cultural rules of practice" (Parker and King 1990). Traditional cultural properties are identified by consulting with Native American groups that have a history of using an area, as well as the Native American Heritage Commission, the Sacred Lands File, and tribal representatives.

Paleontological Resources

Paleontological resources are the fossilized remains of animals and plants. They are typically found in sedimentary rock units, and they provide information about the evolution of life on earth over the past 500 million years or more.

C. CULTURAL RESOURCES BY REGION

Archaeological Resources by Region

As described above, information on the numbers, kinds, and locations of archaeological sites for this Program EIR/EIS was obtained from CHRIS Information Centers. For the most part, the data from CHRIS Information Centers provide archaeological site information only for areas that have been previously surveyed by archaeologists. No archaeological field surveys were conducted for this Program EIR/EIS. However, surveys would be a part of the next stage of environmental review in the project-level EIR/EIS (see Section 3.12-6).

Bay Area to Merced: This region includes central California from the San Francisco Bay Area (San Francisco and Oakland) south to the Santa Clara Valley and east across the Diablo Range to the Central Valley. Archaeological evidence places prehistoric people in California as early as 8,000 to 12,000 years ago; however, in the Bay Area to Merced region, the last 2,000 to 4,000 years are best documented. The regional chronological sequence of time periods (PaleoIndian; Early, Middle, and Late Archaic; and Protohistoric) reflects changes in land use that were influenced by population growth (e.g., shift from small camps to village sites), technological innovation (e.g., shift from use of the spear to bow and arrow), and resource intensification (e.g., the intensive use of mortars and pestles and bedrock milling features for acorn processing). Change also resulted from population movements and displacements, and from outside influences such as climate change and rise in sea level.

The records search for the project APE in the Bay Area to Merced region identified 109 archaeological sites: 95 prehistoric sites, 13 historic sites, and one site with both prehistoric and historic archaeological components. Half of the prehistoric sites are habitation sites, variously referred to as shell mounds, shell middens, and large flaked and ground stone scatters[3] with midden[4] accumulations, but also including sites where house pits were noted. Many of these habitation sites (the shell mounds around San Francisco Bay in particular) contain Native American burials. Burials are noted on the site records for more than 15% of the sites within the APE. Other types of sites identified in the APE include bedrock mortars, lithic scatters,[5] ground

[3] *Ground stone scatter* refers to a site containing milling equipment, including handstones, mortars, and pestles.

[4] *Midden* refers to a mound or deposit containing shells, animal bones, and other refuse that indicates the site of a human settlement.

[5] *Lithic scatter* refers to a site containing general utility implements such as projectile points, bifaces, expedient flake tools, and debitage.

stone scatters, and fire-affected rock scatters.[6] The 13 historic archaeological sites identified within the APE include debris and features associated with nineteenth and early twentieth-century housing developments, farm complexes, and post–World War II trash dumps. The third location of Mission Santa Clara de Asís, near the Santa Clara train station, is the site identified above where both prehistoric and historic components are present.

Sacramento to Bakersfield: This region of central California includes a large portion of the Central Valley (San Joaquin Valley) from Sacramento south to Bakersfield. Archaeological investigations conducted in the southern San Joaquin Valley generally document human occupation of the region since about 12,000 years ago. Population density was low at that time, with the few settlements concentrated around the shores of ancient water sources such as Tulare and Buena Vista Lakes. Because of the rapid accumulation of sediment on the valley floor, older archaeological material tends to be deeply buried. Material from a site near Buena Vista Lake is estimated to be 7,500 to 11,500 years old. Most other archaeological material found in the southern valley appears to be a result of the presence of the Yokuts in the San Joaquin Valley throughout the last 2,000 years.

The Sacramento to Bakersfield portion of the project APE passes through the traditional lands of four Native American groups: the Nissenan, Plains Miwok, Northern Valley Yokuts, and Southern Valley Yokuts. However, the northern San Joaquin Valley is one large area in California for which very little ethnographic information is available. The dearth of information about the early inhabitants of the region is thought to be due in part to their rapid depopulation as a result of European diseases in the early nineteenth century and invasion of their territory by gold miners and others in the mid-nineteenth century. Most of what is known about the early inhabitants comes from the writings of explorers and other early travelers in the region. By piecing together these scraps of information, it has been determined that by the time of the first European visitors, the primary inhabitants of the area were the Northern Valley Yokuts.

Prehistoric archaeological sites in the region consist of habitation sites, many of which represent village locations, and lithic scatters, which may represent camps and activity areas away from villages. Cemeteries and isolated burials are also present. Most prehistoric sites in this region are found between Sacramento and Stockton, where many rivers and streams that originate in the Sierras to the east cross the Modal Alternative and the HST Alternative routes, and between Tulare and Bakersfield near Tulare and Buena Vista Lakes. (See Section 3.14, *Hydrology and Water Resources*, for maps of rivers and streams). Proximity to water was common for habitation sites because the rivers and streams were a source of food and water.

San Joaquin Valley archaeological sites containing material from the historic period include sites with structural remains (usually foundations) and associated refuse, and sites consisting only of refuse.

Bakersfield to Los Angeles: This region of southern California encompasses the southern portion of the Central Valley south of Bakersfield, the mountainous areas between the Central Valley and the Los Angeles basin, and the northern portion of the Los Angeles basin from Sylmar to downtown Los Angeles. The prehistory of the Mojave Desert has been divided into several periods spanning the time from 10,000 BC (approximately 12,000 years ago) to the time of Euro-American contact in the early nineteenth century. Each period has characteristic artifacts and subsistence systems. The earliest occupation of the Mojave Desert for which widely accepted data are available began about 10,000 BC, or 12,000 years ago. The period from 10,000 BC to 5,000 BC (12,000 years ago to 7,000 years ago) is known as the Lake Mojave Period. This period was followed by the Pinto Period (5000 to 2000 BC, or 7,000 to 4,000 years ago); the

[6] *Rock scatter* refers to dispersed pieces of rock.

Gypsum Period (2000 BC to 500 AD, or 4,000 years ago to 1,500 years ago); the Saratoga Springs Period (500 AD to 1200); and the Shoshonean Period (began 1200 AD).

The Milling Stone Period along the southern California coast (about 5000 BC to 1000 BC, or from 7,000 to 3,000 years ago) was characterized by smaller, more mobile groups compared to later periods. The period from 1000 BC to 750 AD (3,000 years ago to 1,350 years ago) is known archaeologically as the Intermediate Period. More specifically, in the Los Angeles basin, perhaps the earliest evidence of human occupation was recovered from the tar pits of Rancho La Brea. In 1914, the partial skeleton of a young woman was discovered in association with a stone used for grinding by hand, called a *mano*. In the 1970s, a collagen sample from the skeleton was dated at circa 9,000 years old. In addition, projectile points similar to those found in the desert dating from 7,000 to 10,000 years ago, as well as crescent-shaped flaked tools, called *crescentics*, have been recovered from bluffs near Ballona Lagoon. The presence of these point types along the coast suggests connections between what is now the Los Angeles area and the cultures of the southeastern California desert regions present during this early period.

A different nomenclature is used to organize the prehistoric record in southern California coastal contexts. The Milling Stone Period manifest primarily along the coast (about 5000 BC to 1000 BC, or from 7,000 to 3,000 years ago) was characterized by smaller, more mobile groups compared to later periods. The period from 1000 BC to AD 750 (3,000 years ago to 1,350 years ago) is known archaeologically as the Intermediate Period. More specifically, in the Los Angeles basin, perhaps the earliest evidence of human occupation was recovered from the tar pits of Rancho La Brea. In 1914, the partial skeleton of a young woman was discovered in association with a stone used for grinding by hand, called a *mano*. In the 1970s, a collagen sample from the skeleton was dated at circa 9,000 years old. In addition, projectile points similar to those found in the desert dating from 7,000 to 10,000 years ago, as well as crescent-shaped flaked tools, called *crescentics*, have been recovered from bluffs near Ballona Lagoon. The presence of these point types along the coast suggests connections between what is now the Los Angeles area and the cultures of the southeastern California desert regions present during this early period.

The Los Angeles basin was part of territory occupied by the Tongva Native American groups (renamed Gabrieliños by early explorers, missionaries, and settlers) when the Spanish arrived in 1769 AD. Tongva settlement and subsistence systems may extend back in time to the beginning of the Late Prehistoric Period, about 750 AD.

Prehistoric archaeological sites types commonly found along the APE for the HST and Modal Alternative alignments in the Bakersfield to Los Angeles region include lithic scatters, milling stations, and quarries. Less common are habitation sites, which can include midden, rock features and, in some cases, human burials. One rock art site, a petroglyph, is also known to exist within the APE.

<u>Los Angeles to San Diego via Inland Empire</u>: This region of southern California includes the eastern portion of the Los Angeles basin from downtown Los Angeles east to the Riverside and San Bernardino areas and south to San Diego generally along the I-215 and I-15 corridors. This region includes a portion of the Los Angeles basin. The prehistory and ethnography of this area were discussed above in the *Bakersfield to Los Angeles* section. The rest of the region consists of the area east of the Santa Ana Mountains in Riverside County and east of the coastal hills in San Diego County.

The 241 known archeological sites within the study area for this region reflect the full range of cultures and periods, from chronologically ancient prehistoric Native American, to historic European (Spanish/Mexican) settlements, to historic Euro-American settlements and more recent periods through World War II urban and industrial growth. There are 130 prehistoric sites and

101 sites from the historic period. The majority of the prehistoric sites (80) are in San Diego County, and 48 of the 101 historic sites are in San Bernardino County.

The San Dieguito Complex[7] was originally thought to represent big-game hunters who moved to the San Diego County coastal area from the Great Basin during Early Holocene time (8,000 to 10,000 years before present [BP], or 10,000–5,000 BC). This movement occurred when warmer, drier conditions resulted in desiccation of the pluvial lakes in the Great Basin. Although it was thought that big-game hunting continued after these people arrived on the coast during Early Holocene time, more recent investigations at Early Holocene sites closer to the coast have shown that a wide range of plant foods, along with small- and medium- sized terrestrial mammals, fish, and shellfish, were also being exploited in these sites. Population size was likely low, with relatively little competition for resources. Therefore, small groups probably migrated throughout the coastal area and the area inland of the coastal hills and mountains to wherever the best resources were available at the time.

The Pauma Complex characterized inland San Diego County and southwestern Riverside County during the period from 3,000 to 8,000 years ago. However, there are few sites that date to the period from 1,300 to 3,000 BP in northern San Diego County and western Riverside County.

A larger population, a more sedentary settlement system, and a more intensive use of available resources characterize the Late Period (100 to 1,300 BP in this area). The large villages, occupied almost year-round, that were present when the Spanish explored this area in 1769 AD developed during this period.

Los Angeles to San Diego via Orange County: This region includes the western portion of the Los Angeles basin between downtown Los Angeles and Los Angeles International Airport (LAX) and the coastal areas of southern California between Los Angeles and San Diego, generally following the existing Los Angeles to San Diego via Orange County (LOSSAN) rail corridor. The prehistory and ethnography of the Los Angeles basin portion of the region was discussed above in the *Bakersfield to Los Angeles* section.

The prehistory of coastal San Diego County begins with the San Dieguito Complex, as discussed above in the *Los Angeles to San Diego via Inland Empire* section. Archaeological sites occupied between 3,000 and 8,000 years ago on the San Diego County coast belong to the La Jolla Complex. Most La Jolla Complex sites are located around the coastal lagoons, which began filling with seawater at the beginning of this period because of a rise in the sea level, as the ice caps melted at the end of the last ice age. Most sites around lagoons on the San Diego County coast were abandoned about 3,000 years ago. However, sites around Peñasquitos Lagoon and San Diego Bay continued to be occupied because these two southern bay/estuary systems did not fill with sediment. Still, in general, there are few sites in the coastal region that date to the period between 1,300 and 3,000 BP. Little is known about settlement and subsistence during this period of San Diego County prehistory.

The Late Period (200 to 1,300 BP in this area) is characterized by a more sedentary settlement system and a more intensive use of available resources. The large villages, occupied almost year-round, that were observed by the Spanish in 1769 AD developed during this period.

Historic-era Properties and Historical Resources by Region

Historic buildings, structures, objects, sites, districts and cultural landscapes in and near the program route alternatives date from the eighteenth century to the mid-1900s, although the vast

[7] *Complex* refers to a group or association of artifacts and subsistence remains that are characteristic of a specific period of time and geographic area.

majority date to the twentieth century. These properties/resources were constructed during the major historic periods of California history, including the exploration and settlement of the Spanish and Mexican eras; the US-Mexican War, the Gold Rush, and statehood in the mid nineteenth century; and subsequent settlement and development of California through the mid twentieth century. The property types also vary widely, but most are dwellings, commercial buildings, or industrial facilities that date to the 1890s and after. Properties/resources dating to before 1890 largely consist of a few remaining adobe structures and sites dating to the Mexican period prior to 1848, and wood-frame dwellings and commercial buildings from the period between 1849 and 1890.

The oldest standing elements of the built environment in California date to the eighteenth century, during the period when California was a Spanish colony. Spanish exploration and settlement began in 1769 with the Portola Expedition and continued with the establishment of 21 missions and several presidios (forts) and pueblos (towns) near the coast between San Diego and Sonoma. Three of the missions, San Gabriel, San Juan Capistrano, and Santa Clara, are located near proposed project alignments. The San Gabriel Mission is located along the proposed HST Alternative alignment in the Los Angeles to San Diego via Inland Empire region. The San Juan Capistrano Mission is located near all of the proposed HST and Modal Alternative routes through San Juan Capistrano in the LOSSAN region. The third location of Mission Santa Clara de Asís, near the extant, historic Santa Clara train station is an archaeological site with both prehistoric and historic components. It lies within the HST alignment in the Bay Area to Merced region. (See Chapter 2, *Alternatives*, for maps of the routes).

The Spanish made land grants to retired soldiers and other Spanish citizens interested in settling the area. The Mexican government continued the land grant system after gaining independence from Spain in 1821 and dissolving the mission system in 1834. The presidios and pueblos founded during the Spanish/Mexican period, including San Francisco, San Jose, Los Angeles, and San Diego, grew slowly during the 1830s and 1840s and relatively few properties/resources are predicted for the HST and modal routes that pass through these cities.

The United States acquired California upon the ratification of the Treaty of Guadalupe-Hidalgo at the close of the Mexican War in 1848. The subsequent gold rush of 1849 lured immigrants to the west coast from across the United States and around the world. California became a state in 1850 and it continued to grow in population as completion of the transcontinental railroad in 1869 brought more settlers. Southern California remained a sparsely settled cattle ranching area until the arrival of the Southern Pacific Railroad in the 1870s and the Atchison, Topeka, and Santa Fe Railroad in the 1880s. New towns developed across the state in the nineteenth century, but were especially clustered along the state's railroad routes. Some of these properties / historical resources (such as dwellings, businesses, factories and other buildings and structures from the Victorian era) remain along the various segments of the proposed HSR routes and modal alternatives.

The early twentieth century saw continued urban expansion in both northern and southern California, especially in conjunction with the first widespread use of automobiles. Popular residential architectural styles during this period included the Craftsman bungalow, as well as the Spanish Colonial Revival and other revival styles. Increasing use of automobiles also led to construction of linear commercial strips and other roadside development along arterials, although industry and major shipping facilities largely remained clustered along rail lines and maritime ports. By the late 1930s and during World War II, dwellings, commercial, industrial, and public buildings were often designed in the Art Deco Style (or the related Art, Zigzag, or Streamline Moderne styles). The construction boom of the post-war period brought residences in the Ranch style with an open plan and attached garage, often laid out in expansive suburbs of builders' tract homes. Regional malls and shopping centers developed on the outskirts of communities, while the industrial and shipping facilities of the post-war period became more inter-modal as trucking competed with rail and sea transportation. The areas along the HST routes and modal alternatives contain properties/resources of each of these types and from each decade of the twentieth century.

Bay Area to Merced: By far the largest concentrations of historic buildings, structures, objects, sties, districts, and cultural landscapes (or potential historic properties/historical resources) in this region are in the urban centers of San Jose, San Francisco, and Oakland, but resources of all types appear throughout the Bay Area to Merced region. A certain number of properties/resources appear in other towns, and to a lesser extent, in the rural countryside of the Santa Clara and Central valleys. Towns that were important local trade centers in the late nineteenth century, like Morgan Hill and Gilroy, exhibit concentrations of historical resources along the project corridors. Diridon (Cahill) Station and Santa Clara Station in San Jose are listed on the National Register of Historic Places (NRHP) and California Register of Historical Resources (CRHR). Diridon Station is a NRHP historic district, and the Santa Clara Station is a multi-component listed historic property and is a historical resource for the purposes of CEQA.

Other historic districts in the region include the Redwood City Historic District along the Caltrain alignment, the Downtown Oakland Historic District, the Oakland Waterfront Warehouse District along the Oakland to San Jose via I-880 route, and the Alviso Historic District and Agnews Insane Asylum Historic District along the Oakland to San Jose via Milford route. There is also one historic district, the U.S. Naval Air Station Sunnyvale Historic District, in the San Francisco to San Jose segment, as well as two bridges listed in the NRHP, Carquinez Bridge and the Oakland–San Francisco Bay Bridge, on the Modal Alternative alignment. Rural historic properties and historical resources that appear long the HST routes include farm and ranch complexes, as well as infrastructure elements (such as water conveyance systems, bridges, industrial complexes, and rail stations).

Sacramento to Bakersfield: Buildings from the historic period along the alternative corridors in the Sacramento to Bakersfield region consist of residential and commercial structures located mostly in the towns and cities that developed along the Southern Pacific Railroad (now the Union Pacific Railroad [UPRR]) and Central Pacific Railroad routes in the 1870s.[8] Some of the region's railroad bridges and stations are also historic, along with some roads, highway bridges, and cemeteries. Construction of agricultural irrigation projects in the San Joaquin Valley began in the late 19^{th} century and continued into the 20^{th} century. There are many canal and levee systems in this region, some of which may be historic.

Because the UPRR tracks were initially constructed in the Central Valley in the mid- to late nineteenth century, the towns along the HST alignments that use the UPRR corridor have a high potential to contain nineteenth-century buildings. For example, one of the towns that developed during the nineteenth century along the UPRR corridor between Sacramento and Stockton is Elk Grove, a part of which is now a National Register Historic District. Alignments that use the Burlington Northern Santa Fe (BNSF) corridors established in the early twentieth century avoid many of the smaller towns and pass through far fewer historically sensitive areas.

Bakersfield to Los Angeles: Historic structures along the project corridors in the Bakersfield to Los Angeles region are primarily twentieth-century residential, commercial, and industrial structures located within cities. Large tracts of residential houses are most common, with industrial and commercial structures largely confined to existing railroad rights-of-way and station areas in Los Angeles.

8 The Central Pacific was later purchased by the AT&SF Railroad (now the BNSF Railroad).

Structures dating to before 1900 are rare. In many parts of the region, such as the Antelope Valley, structures from this time period were sparse and were built in perishable vernacular styles (e.g., wooden barns and other structures). In the largest cities of the region, Los Angeles and Bakersfield, large sections of houses and commercial structures built originally before 1900 have been replaced by subsequent development.

Los Angeles to San Diego via Inland Empire: Before 1900, the region's small towns had developed small-scale residential neighborhoods surrounding their central blocks. In the region's rural areas, the pre-1900 built environment consisted mostly of farm/ranch homes and related outbuildings, small bridges, dirt roads, and railroads and railroad-related terminals and warehouses. The small towns consisted mostly of residential and commercial buildings and offered better-established roads. Railroad stations in these smaller towns often served as the commercial hub for the surrounding areas.

By 1900, Los Angeles, Riverside, San Diego, and the central blocks of the smaller outlying towns had developed commercial/industrial buildings and were surrounded by more residential land uses. Between 1900 and 1929, the built environment changed markedly, with the advent of the automobile age. Not only did the region experience population growth, but major improved road networks were also constructed to accommodate increased numbers of automobiles and trucks. During this timeframe, new types of specialized structures appeared in the built environment, including gas stations, parking garages, and auto/truck sales and repair/maintenance facilities. Urbanized areas continued to grow, and use of streetcars and interurban passenger rail services peaked at this time. In the years following World War I, Southern California experienced growth in military bases and training facilities. Important industrial facilities expanded in the Riverside and San Bernardino vicinities with Kaiser steelworks in Fontana being a notable example.

Very few pre-1900 structures remain near the proposed project alignments. A notable exception is the San Gabriel Mission (founded in 1771), located immediately adjacent to the former Southern Pacific Railroad (now UPRR) route through San Gabriel. There is the potential for a few pre-1900 buildings, including rail stations, along this railroad route in Pomona, Ontario, Guasti, San Bernardino, and Temecula. Los Angeles Union Station (LAUS) passenger terminal is listed in the NRHP.

Los Angeles to San Diego via Orange County: Historic structures in the LOSSAN region are primarily twentieth-century (1900 to 1929 and 1930 to 1958) residential, commercial, and industrial structures located within cities. Large tracts of residential houses are most common, with industrial and commercial structures largely confined to existing railroad rights-of-way in the Los Angeles and San Diego areas. However, many of the medium-sized cities of the region, such as Anaheim, Fullerton, and San Clemente, began as small towns in the late nineteenth or early twentieth century. The historic core areas of cities in this region commonly preserve some buildings from this time period.

Structures dating to the period before 1900 are rare. As in other parts of southern California, structures from this time period were sparse in much of this region and were built in perishable vernacular (wood frame) styles. However, there are notable exceptions, especially the Spanish and Mexican Period development in downtown San Juan Capistrano (1769 to 1848) around Mission San Juan Capistrano (founded in 1776) and the Hispanic to American Transition Period (1848 to 1870) development along the waterfront of San Diego, and Old Town San Diego. In the largest cities of the region, Los Angeles and San Diego, large sections of houses and commercial structures built before 1900 have been replaced by subsequent development.

Traditional Cultural Properties

Information regarding traditional cultural properties was derived from the NAHC's review of the Sacred Land files, the Native American Outreach Workshops, from presentations at public hearings, and in formal comments received on the draft EIR/EIS.

Based on their review of the Sacred Lands file, the NAHC identified one traditional cultural property near the project's APE. Within the Bakersfield to Los Angeles region, the property is described as a sacred power area and a worship and ritual site. It is, however, located well north of SR 58 and the High-Speed Train Alignment, and so lies outside of the project APE. The NAHC did not identify any other traditional cultural property within the APE of the other four regions (Bay Area to Merced; Sacramento to Bakersfield; Los Angeles to San Diego via Inland Empire; Los Angeles to San Diego via Orange County).

Letters were distributed to Native American potential contacts provided by the NAHC. No direct reply to the contact letters was received from Native Americans, that identified traditional cultural properties that could be affected by the project.

At each of the three Native American Outreach Workshops, attendees provided information concerning potentially sensitive resources and concerns. At the Frazier Park workshop, concerns were raised about potential impacts on sensitive cultural resources along the HST alignment options through the I-5 corridor between Bakersfield and Los Angeles, in particular for the northern portion of the Tehachapi range area between Grapevine and Frazier Park. At the San Luis Recreation Area workshop, concerns were raised about potential impacts on sensitive cultural resources along the HST Pacheco Pass alignment options, both through the mountains and in the Santa Clara Valley between Gilroy and Morgan Hill. During this meeting it was also noted by those attending that the Altamont Pass corridor, would have considerably more potential impacts on Native American traditional cultural properties than either the Diablo Range direct or Pacheco Pass corridors that are being considered for further HST evaluation. At the Temecula workshop, concerns were raised about potential impacts on sensitive cultural resources along the HST alignment options through the Soledad Canyon between Antelope Valley and Los Angeles, and in regards to potential alignment and tunneling impacts through the mountain range just south of Temecula along the I-215/I-15 HST alignment.

At public hearings, two individuals representing two different tribes presented statements. Two statements have also been submitted as written comments representing tribal concerns. At the April 28, 2004 hearing in Fresno, Mr. Val Lopez, Chair of the Amah Mutsun Tribal Band, spoke in general support of the HST project, requesting continued involvement and consultation on subsequent planning and construction of the project, and provided perspective on traditional tribal territories for the Amah Mutsun and Yokuts. In the spring of 2004, the Authority received public comments from Robert Gomez, Tubatulabal, concerning continued consultation with Native Americans, natural and cultural resources preservation, and disposition of archaeological collections. On June 23, 2004, representatives of the Pechanga Band of Luiseno Indians in Temecula requested continued involvement and consultation throughout subsequent phases of the project, including government-to-government consultation, and inclusion in the development of agreement documents concerning cultural resources. Subsequent to that public statement, the Pechanga Band submitted written comments stating their concerns with potential project impacts on significant cultural resources, sacred sites, and Native American human remains. Among their specific requests, the Pechanga Band asks that the Authority meet with tribal representatives in-person regarding confidential information concerning sensitive locations, in the interest of avoiding impacting such locations.

Paleontological Resources By Region

California's rich geologic record and complex geologic history has resulted in exposure of many rock units with high paleontologic sensitivity at the surface. The fossil record in California is exceptionally prolific; abundant fossils representing a diverse range of organisms have been recovered from rocks as old as 1 billion years to as recent as 11,000 years. These fossils have provided key data for charting the course of the evolution and extinction of various types of life on the planet, both locally and globally, as well as for determining paleoenvironmental conditions, sequences and timing of sedimentary deposition, and other details of geologic history.

The following paragraphs summarize key paleontological resources by region. More detailed information is given in the regional technical reports on cultural and paleontological resources.

Bay Area to Merced: The major fossil-bearing units in the Bay Area to Merced region include the Irvington Gravels, Livermore Gravels, Merced Formation, Santa Clara Formation, Tulare Formation, Tehama Formation, Pinole Tuff, San Pablo Formation, Orinda Formation and Siesta Formation (Contra Costa Group), Briones Formation (San Pablo Group), Markley Sandstone, Nortonville Shale, Martinez Formation, Panoche Formation, Quinto Formation, Chico Formation, and Franciscan Formation. Pleistocene alluvial units also contain important paleontological resources.

Of the 237 vertebrate fossil localities identified within the study area, 93 (nearly 40%) are in materials of Pleistocene age, including the Los Banos alluvium, Riverbank Formation, Irvington Gravels, and Tulare Formation. Other units with a high sensitivity include the Pinole Tuff, the Contra Costa Group, and the San Pablo Group, all of which are of Miocene age. The Pleistocene and Miocene age geologic units are units with a high potential for containing vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils.

Sacramento to Bakersfield: The most important paleontological resources in the Sacramento to Bakersfield region are contained in the Modesto-Riverbank Formations, the Turlock Lake-Laguna Formations, and the Franciscan Formation.

The Modesto-Riverbank Formations are largely unconsolidated Middle to Late Pleistocene units composed of interbedded poorly sorted brownish sandstone and siltstone with lesser amounts of pebble to cobble conglomerate. They are primarily fluvial (stream) deposits, and have yielded a wide range of fossils including clams, fish, turtles, frogs, snakes, birds, bison, mammoths, mastodons, ground sloths, camels, horses, deer, dire wolves, coyotes, rabbits, rodents, and land plant remains, including wood, leaves, and seeds.

The Turlock Lake-Laguna Formations are Pliocene in age and are composed of interbedded poorly sorted, reddish-brown siltstone and sandstone with lenses of pebble to cobble conglomerate. They are primarily fluvial deposits, but lacustrine (lake) beds are not uncommon. The Turlock Lake-Laguna Formations have yielded fossil remains at many sites, including petrified wood and the bones and teeth of a diversity of extinct land mammals.

The Franciscan Formation ranges in age from Jurassic through Cretaceous. The formation consists mainly of sandstone and shale or mudstone, but contains lesser amounts of chert, serpentinite, and greenstone. Coherent sedimentary units in the Franciscan primarily record deep marine deposition. Fossil vertebrates are rare; molluscan fossils and freshwater gastropods and pelecypods have been reported.

The Modesto-Riverbank and Turlock Lake-Laguna Formations occur in all segments of the Modal Alternative alignment except between Sacramento and Stockton. Along the HST Alternative route, they occur between Sacramento and Stockton in the Central California Traction (CCT) alignments and in all the alignments between Modesto and Merced. The Franciscan Formation occurs only on the Modal Alternative route between Merced and Fresno.

Bakersfield to Los Angeles: Sixteen different formations occur along both the Modal and HST Alternative corridors in this region. In the Bakersfield to Los Angeles region, the following formations have the potential to yield fossils.

- The Tecuya Formation along I-5 from SR-99 to SR-14 and the I-5 Tehachapi crossing, with oreodont artiodactyl and amphicyonid carnivore fossils.
- The Tick Canyon Formation along the SR-14 corridor, with horse, camel, carnivore, and oreodont artiodactyl fossils.
- The Kinnock Formation along the SR-58 corridor, with canid fossils.
- The Monterey Formation along I-405 between LAUS and Burbank, with fish and marine mammal fossils.
- The Towsley Formation along I-405 to Burbank, and along I-5 from SR-99 to SR-14 and in the Soledad Canyon and Tehachapi crossing, with whale fossils.
- The Castaic Formation along SR-14 and I-5 in Soledad Canyon and the Tehachapi crossing, with fish, mollusk, sea cow, sea turtle, and tapir fossils.
- The Mint Canyon Formation along SR-14 and in Soledad Canyon, with horse, camel, peccary, and rodent fossils.
- The Peace Valley Formation along I-5 between SR-99 and SR-14 and in the Tehachapi crossing, with cypriniodont, plant, and killifish fossils.
- The Ridge Route Formation along I-5 from SR-99 to SR-14 and in the Tehachapi crossing, with rhinoceros, horse, ground sloth, mollusk, lizard, snake, gopher, bony fish, and plant fossils.
- The Horned Toad Formation along SR-58, with gomphothere fossils.
- The Walker Formation along SR-58, with shark, ray, bony fish, whale, and marine bird fossils.
- The Pico Formation along SR-14 and I-5 and in Soledad Canyon, with shark, whale, and clam fossils.
- The Harold Formation along SR-14 and in the Antelope Valley area, with mammals and birds fossils.
- The Saugus Formation along SR-14 and I-5 between SR-99 and SR-14, and in Soledad Canyon and the Tehachapi crossing, with camel, horse, tapir, deer, lizard, gopher, canid, shark, ray, and bony fish fossil.
- The Kern River Formation along SR-58, with mustelid carnivore, peccary, mouse, and vulture fossils.
- Older Quaternary alluvium along I-405 to Burbank; along SR-14, SR-58, and I-5 between SR-99 and SR-14; and in Soledad Canyon, Antelope Valley, and the Tehachapi crossing, with large mammal and small nonmammalian vertebrate fossils.

Los Angeles to San Diego via Inland Empire: The following formations that occur along proposed alignments of the Modal and HST Alternatives in the Los Angeles to San Diego via Inland Empire region have the potential to yield fossils.

- The Silverado Formation from March Air Reserve Base (ARB) to Mira Mesa, with mollusk fossils.

- The Ardath Shale from Mira Mesa to downtown San Diego, with shark, ray, bony fish, and marine microorganism and macroinvertebrate fossils.
- The Scripps Formation from Mira Mesa to downtown San Diego, with shark, ray, bony fish, marine invertebrate, rhinoceros, artiodactyl, brontothere, uintathere, crocodile, turtle, as well as wood fossils.
- The Friars Formation between Escondido and San Diego, with artiodactyl, perissodactyl, primate, opossum, insectivore, and rodent fossils.
- The Stadium Conglomerate Formation from Mira Mesa to San Diego and Mira Mesa to Qualcomm Stadium, with artiodactyl, perissodactyl, primate, opossum, insectivore, rodent, carnivore, and rhinoceros fossils.
- The Mission Valley Formation between Mira Mesa and San Diego, with shark, ray, bony fish, marine microorganism and macroinvertebrate, artiodactyl, perissodactyl, primate, opossum, insectivore, and rodent fossils.
- The Puente Formation from Los Angeles to March ARB and Mira Mesa, and from LAUS to Pomona via El Monte and South El Monte, with marine and terrestrial vertebrate, invertebrate, and plant fossils.
- The Sespe Formation from March ARB to Mira Mesa, with camel, rhinoceros, oreodont, carnivore, insectivore, primate, and rodent fossils.
- The Vaqueros Formation from March ARB to Mira Mesa, with shark, ray, crab, and clam fossils.
- The Fernando Formation from Los Angeles to March ARB and from LAUS to Pomona via El Monte, with shark, ray, bony fish, bivalve, snail, whale, bird, camel, and tapir fossils.
- An unnamed sandstone unit from March ARB to Escondido, with large mammal, small vertebrate and invertebrate, and giant teratorn fossils.
- The Lindavista Formation from Mira Mesa to San Diego and Escondido to Mira Mesa and Qualcomm Stadium, with shark, whale, and marine invertebrate fossils.
- The Pauba Formation from March ARB to Mira Mesa, with large and small vertebrate fossils.
- The Bay Point Formation from Mira Mesa to San Diego, with shark, ray, bony fish, and mollusk fossils.
- Quaternary terrace deposits from Mira Mesa to the Transit Center, with small and large mammal and bird fossils.
- Older Quaternary alluvium from March ARB to San Diego, with large mammal and plant fossils.

<u>Los Angeles to San Diego via Orange County</u>: The following formations in the LOSSAN region have the potential to yield fossils.

- The Ardath Shale and Scripps Formation along SR-52 to San Diego, with shark, ray, bony fish, marine microorganism and macroinvertebrate, rhinoceros, artiodactyl, brontothere, uintathere, crocodile, turtle, as well as wood fossils.
- The Delmar Formation in Del Mar and along I-5/I-805 at the SR-52 split, with estuarine vertebrate and invertebrate, aquatic reptile, and rhinoceros fossils.
- The Torrey Sandstone from Encinitas to Solana Beach and Del Mar, with plant and marine invertebrate fossils.

- The San Mateo Formation at Camp Pendleton, with horse, camel, peccary, llama, sea cow, fur seal, walrus, sea otter, sea bird, whale, dolphin, shark, ray, bony fish, and marine invertebrate fossils.
- The Capistrano Formation from Irvine to San Juan Capistrano, Dana Point, San Clemente, Camp Pendleton, Oceanside, and Carlsbad, with whale, walrus, sea cow, fur seal, sea bird, shark, ray, bony fish, and kelp fossils.
- The Niguel Formation from Irvine to San Juan Capistrano, with marine mollusk and marine vertebrate fossils.
- The San Diego Formation along SR-52 to San Diego, with shark, ray, bony fish, marine invertebrate, sea bird, walrus, fur seal, cow, whale, dolphin, terrestrial mammal, wood, and leaf fossils.
- The Lindavista Formation along I-5/I-805, with marine invertebrate, shark, and whale fossils.
- The Bay Point Formation along SR-52 to San Diego, with shark, ray, bony fish, and mollusk fossils.
- Unnamed marine terrace deposits from Camp Pendleton through Encinitas and Solana Beach to the Santa Fe Depot in San Diego, with marine invertebrate, shark, ray, bony fish, and terrestrial mammal fossils.

3.12.3 Environmental Consequences

A. EXISTING CONDITIONS COMPARED TO NO PROJECT ALTERNATIVE

The No Project Alternative is composed of transportation projects other than the proposed HST system that are projected to be completed between the time of this Program EIR/EIS and 2020, including local, state, and interstate transportation system improvements designated in existing plans and programs. No additional impacts on cultural resources would occur under No Project beyond those addressed in environmental documents for those projects.

Because it was not realistically feasible for this Program EIR/EIS to identify or quantify all the statewide impacts on or mitigation activities for cultural resources associated with all of the projects considered as part of the No Project Alternative, it is assumed that the existing condition is representative of No Project conditions. It is possible that other transportation projects (not including the Modal or HST Alternatives) may impact some existing cultural resources by 2020, and that these changes to the baseline would be described and quantified in subsequent environmental analysis and reflected in future database information. This Program EIR/EIS addresses the general potential for the proposed project to affect or impact cultural resources as they exist at present and uses this information to compare the potential for impacts from the alternatives evaluated.

B. NO PROJECT ALTERNATIVE COMPARED TO MODAL AND HIGH-SPEED TRAIN ALTERNATIVES

This section compares the predicted sensitivity or potential for the alternatives to cause adverse effects or impacts to archaeological, historic, and/or paleontological properties/resources, and which would require mitigation. No new inventory or evaluation surveys of properties/resources were conducted for this Program EIR/EIS because that identification and evaluation work would be conducted as part of the next stage of environmental review in the project-level EIR/EIS (see Section 3.12.6).

The Modal Alternative would potentially affect or impact cultural resources (archaeological and historic properties/resources) as a result of expanding freeway rights-of-way to add lanes and as a result of airport expansion (new runways). Systemwide, the Modal Alternative is ranked as medium in terms of its potential impact on cultural resources Cumulative effects and impacts are likely because the combined effects and impacts from the Modal Alternative, No Project, and other community residential and commercial development projects would be greater than from the Modal Alternative alone. The Modal Alternative is ranked as high in terms of its potential effect or impact on paleontological resources from expansion of highways and airports. This ranking is a result of the estimated 2,970 lane mi (4,780 km) of expansion statewide and the number of formations identified as sensitive for paleontological resources that would be crossed by highways.

The HST Alternative would potentially affect or impact cultural resources as a result of its construction, including grading, cutting, tunneling, and erecting pylons for elevated track, as well as station construction. Systemwide, the HST Alternative is ranked as medium to high in terms of its potential effect or impact on archaeological, historic, and or paleontological properties/resources. The HST Alternative's potential effect or impact on historic properties/resources is generally higher on a systemwide basis compared to No Project or the Modal Alternative because the HST Alternative would use existing rail corridors at many locations. These existing rail corridors developed during the historic period and therefore the rail lines tend run through the oldest parts of cities and towns and are surrounded by historic properties/resources. Cumulative effects or impacts are likely because the combined effects and impacts from the HST Alternative, projects anticipated or planned for under No Project, and other residential and commercial development projects in the study area can be expected to be greater than from the HST Alternative alone. Potential effects or impacts on historic properties during operation of the HST Alternative related to noise or visual impacts are discussed in Sections 3.4 and 3.9, respectively, of this Program EIR/EIS.

The Modal and HST Alternatives would have greater potential effect and impact on cultural resources than No Project. Although many of the potential effects or impacts could be avoided or minimized through design refinements or alignment changes in a linear facility such as a highway or rail corridor, it is not always feasible to avoid effects or impacts to cultural resources, and mitigation measures would need to be identified and evaluated to address these situations for specific projects.

Table 3.12-1 summarizes the comparison of potential effects and impacts on cultural and paleontological resources for each of the alternatives. The table depicts relative sensitivity, or the potential for the alternatives to cause adverse effects or impacts to cultural resources. This table does not identify specific adverse effects or impacts at this programmatic level of review.

Table 3.12-1
Summary Rating Table—Potential Impacts on Cultural and Paleontological Resources

	Archaeological Resources	Historic Structures	Paleontological Resources
Bay Area to Merced			
No Project	Medium	Medium	Low
Modal	Medium	Medium	High
HST	Medium	High	Medium
Sacramento to Bakersfield			
No Project	Low	Low	Low
Modal	Medium	Medium	High
HST	Medium	High	Medium

	Archaeological Resources	Historic Structures	Paleontological Resources
Bakersfield to Los Angeles			
No Project	Low	Low	Low
Modal	Medium	Medium	High
HST	High	High	Medium
Los Angeles to San Diego via Inland Empire			
No Project	Low	Low	Low
Modal	Medium	Medium	High
HST	Medium	Medium	High
Los Angeles to San Diego via Orange County			
No Project	Low	Low	Low
Modal	Medium	Medium	High
HST	High	High	High

3.12.4 Comparison of Alternatives by Region

This section compares the potential effects or impacts to cultural and paleontological resources predicted for the program alternative options in each of the five regions, based on available information. At this level of analysis, the extent and types of effects or impacts on specific cultural and paleontological resources are not known, instead this comparison presents the likelihood for these alternatives to cause effects or impacts that would meet criteria for significance under NEPA/NHPA and CEQA.

A. BAY AREA TO MERCED

Modal Alternative

The total number of archaeological sites that could be potentially impacted by the Modal Alternative in this region is 47. The northern portion of the Modal Alternative route from San Francisco/Oakland to San Jose has a medium ranking for archaeological sensitivity, while the southern portion from San Jose to Merced is ranked as low.

Sixty percent of the areas along the Modal Alternative route in this region developed during the historic period are within the potentially affected area resulting in an overall rank of medium sensitivity for historic properties/resources. The greatest number of historic buildings in or near the APE for the Modal Alternative is found between San Francisco/Oakland and San Jose, where 100% of this area was developed during the historic period, however, the ranking for the Modal Alternative in the entire Bay Area to Merced region is medium.

The Modal Alternative has the potential to affect an estimated 81 to 93 mi (130 to 150 km) of highly sensitive geologic units within the study area. As such, this receives a high sensitivity rank concerning paleontological resources.

High-Speed Train Alternative

The total number of archaeological sites for the HST Alternative ranges from 16 (for the Oakland to San Jose via Hayward Line and the Diablo Range Direct corridors) to 35 (for the San Francisco to San Jose and Diablo Range Direct corridors). For archaeological resources, the No Project, Modal, and HST Alternatives are all ranked as medium, although the HST Alternative has a somewhat greater potential for impacts.

One hundred percent of both the Oakland to San Jose study area and the San Francisco to San Jose study area developed during the historic period and these segments of the HST alternative in the Bay Area to Merced region have a high ranking for adverse effects or impacts. This high potential for adverse effect or impact could be reduced to medium if HST construction could be confined to the existing rail corridor and grade-separation impacts were minimized, particularly in the areas of the downtown Oakland Historic District, the Oakland Waterfront Warehouse District, the Redwood City Historic District, the Agnews Insane Asylum Historic District, the Santa Clara Station Historic District, and the Cahill (Diridon) Station Historic District in San Jose. The outlying segments of the HST alternatives in the Bay Area to Merced region are ranked medium for historic properties/resources, as are the No Project and Modal Alternatives.

An estimated 28 mi (45 km) of geologic units identified as highly sensitive for paleontological resources have been identified for the HST Alternative. For opaleontological resources, this correlates to a medium sensitivity.

High-Speed Train Alignment Options Comparison

All segments of the HST Alternative in this region, except the two Pacheco Pass alignment options, have a medium sensitivity for archaeological resources. The two Pacheco Pass options are ranked as low. For the San Jose to Merced portion of the study area, there is a slight difference between the Pacheco Pass routes (14%) and the Diablo Range direct routes (9%). The greatest numbers of archaeological sites occur along the two Diablo Range tunnel alignments (more than 20 each).

Both alignment options from San Jose to Merced via Pacheco Pass are ranked high for potential impacts on historic structures, whereas the alignment options using the three Diablo Range direct alignments area ranked low. Selection of the Diablo Range direct options would reduce potential impacts on historic structures.

For the HST alignment options, the key differences for paleontological resources are between the Pacheco Pass options, which would cross about 11 mi (18 km) of high-sensitivity rock units and 13 mi (21 km) of moderate-sensitivity units, compared to the Diablo Range Direct options, which would cross about 2 mi (3 km) of high-sensitivity rock units and 14 mi (23 km) of moderate-sensitivity units.

B. SACRAMENTO TO BAKERSFIELD

Modal Alternative

There are 85 archaeological sites in the study area for the Modal Alternative (50 prehistoric sites and 31 historic sites). Most sites are in the Sacramento to Stockton corridor (27) and the Tulare to Bakersfield corridor (30). Under the Modal Alternative, most sites are along SR-99, with relatively few sites along I-5. The SR-99 alignment under the Modal Alternative has the highest potential to impact archaeological resources, while the I-5 corridor is ranked low, with the lowest number of sites. The overall archaeological sensitivity ranking for the Modal Alternative is medium.

More than 50% of the length of the SR-99 Sacramento to Stockton, Modesto to Merced, and Merced to Madera segments was developed during the historic period. As a result, the Modal Alternative has a medium potential to impact historic structures.

The Modal Alternative has a high potential to impact paleontological resources.

High-Speed Train Alternative

The number of archaeological sites potentially affected by the HST Alternative varies greatly, ranging from 55 to 225, depending on which alignments are chosen. In general, the HST alignments that have fewer archaeological sites are those that bypass the urban cores to the extent possible and follow the BNSF corridor. The APEs for the UPRR alignments that go through the urban cores have the most archaeological sites. For example, between Modesto and Merced, the alignments that follow the UPRR corridor and go to the Merced Downtown Station each have the potential to affect more than 100 sites. The alignments that follow the BNSF corridor to the Merced Municipal Airport each have the potential to affect only one site. The minimum and maximum number of sites for the other corridors are not as high or low; they range from 17 to 32 for Sacramento to Stockton, 18 to 19 for Stockton to Modesto, three to 14 for Merced to Fresno, and 12 to 40 for Tulare to Bakersfield. Overall, the HST has a medium potential to impact archaeological resources.

Though the degree to which the areas along the HST alignment options developed during historic periods varies greatly, the HST Alternative has a high potential to effect or impact historic properties/resources because all routes pass through station locations in historic urban cores, although there are lower-ranked alternatives for most of the alignments between stations. Examples include historic properties/resources in the area of the downtown Sacramento Valley Station, which is the oldest area of the city, and the segment from Sacramento to Stockton with five known historic sites, two preservation areas, and one State Historic Landmark. The percentage of the route length with the potential to contain historic structures ranges from 20% to 37%. In urban cores, however, the route percentages of historic properties/resources would be nearly 100%. Thus, the UPRR alignments that traverse the urban cores would potentially cause the greatest number of impacts to historic properties/resources. For example, the area around the following stations are almost entirely of historic age: the Downtown Sacramento Valley Station, Stockton ACE Downtown Station, Modesto Downtown Station, Fresno Downtown Station, Hanford Station, and Truxtun Station in Bakersfield. The UPRR route would go through Elk Grove and Galt, two towns established in the mid-1800s.

The HST Alternative has a medium potential to impact paleontological resources.

High-Speed Train Alignment Options Comparison

The potential impact of the HST Alternative on archaeological resources varies greatly, depending on the alignments chosen. The segments between Modesto and Merced have a high potential to affect archaeological resources, with about two-thirds of the more than 150 recorded historical sites that lie along the corridor concentrated in two areas: along a portion of the UPRR Line between Keyes and Atwater, and at the former Castle Air Force Base. The potential for effects or impacts to historic properties is somewhat greater along the UPRR route because of the towns dating to the 1870s. Similarly, from Fresno to Tulare, the UPRR corridor would have the greatest number of historic structures per mile, over the BNSF alignment options. In general, the alignments that would have fewer historic structures are those that follow the BNSF corridor and bypass urban cores.

C. BAKERSFIELD TO LOS ANGELES

Modal Alternative

Overall, the Modal Alternative for this region has a medium potential for impacting archaeological sites, with 49 archaeological sites recorded along this alignment. Most sites are in the I-5 corridor between SR-99 and SR-14 (18 sites) and in the SR-14 corridor between Palmdale and I-5 (30 sites). There is a high potential for as-yet-unidentified buried sites from the historic period (which may also be of concern to Native Americans) in the Tejon area south of the Grapevine along I-5 between SR-99 and SR-14. In this area, the Sebastian (Tejon) Indian Reservation is

California Historical Landmark #133 and the Rose Stage Station is California Historical Landmark #300. In addition, Fort Tejon State Historic Park and the Tejon Ranch headquarters are located in this area.

For the Modal Alternative, the route following I-5 between Bakersfield and Santa Clarita has a medium potential to impact archaeological sites, while the route through the Antelope Valley (SR-58/SR-14) has a low potential impact on archaeological sites. The remainder of the I-5 corridor from Santa Clarita to LAUS has a high potential for impacts on archaeological sites.

Half of the Modal Alternative segments are in areas that developed in the historic period, (prior to 1958). These include I-5 from I-405 to Burbank, I-5 from Burbank to LAUS, and SR-58 and SR-14 between Bakersfield and Palmdale. The area around Burbank Airport was almost completely developed during the historic period. The Modal Alternative has a low to medium ranking for potential to effect or impact historic properties/resources in this region. Though sensitivity varies greatly within this study area, the overall level of potential impacts is considered medium.

The Modal Alternative would also impact paleontological resources because existing highways traverse 30 formations with high paleontologic sensitivity, resulting in an overall high-sensitivity ranking.

<u>High-Speed Train Alternative</u>

The HST Alternative for this region receives a high-sensitivity rank for potential effects to archaeological resources and historic-era structures (Table 3.12.1). The sensitivity of subsegments, however, differs considerably. For the HST Alternative, there are two corridors under consideration between Bakersfield and Sylmar in the northern San Fernando Valley: the I-5 corridor and the SR-58–Antelope Valley–Soledad Canyon corridor. There are 17 recorded archaeological sites in the study area for the I-5 corridor using the Union Avenue corridor from Bakersfield to I-5 and 16 sites using the Wheeler Ridge corridor from Bakersfield to I-5. One prehistoric site reported to contain human burials is recorded within the Union Avenue study area. The Tehachapi Crossing portion of the I-5 corridor passes through the Tejon area discussed under the Modal Alternative.

The HST corridor that passes through the Antelope Valley has the potential to affect 68 recorded archaeological sites. The majority of the sites in the SR-58 corridor and the Soledad Canyon corridor are prehistoric. A burial was reported at one of the sites in the Soledad Canyon corridor. Most sites in the Antelope Valley corridor are historic trash scatters along the railroad.

The HST alignments between Sylmar and LAUS have no known archaeological sites because most of this area was not surveyed prior to development. The area developed prior to 1971 before systematic archaeological surveys began to be required. However, impacts are likely. There is a high potential for buried prehistoric sites in this area, especially along the Los Angeles River. There is also a high potential for buried historic sites in the vicinity of LAUS, located in the historic core of Los Angeles, because archaeological material from the nineteenth-century occupation of the area by Hispanic Americans, Chinese Americans, and Anglo Americans has been recovered.

More than 70% of the following HST Alternative alignments had begun development by 1958: Burbank Airport to downtown Burbank, the Burbank Airport Station and Downtown Burbank Station, the MTA/Metrolink route from downtown Burbank to LAUS, and the I-5 route from downtown Burbank to LAUS (cut and cover at Silverlake option). LAUS is listed in the NRHP.

High-Speed Train Alignment Options Comparison

The HST alignment from Bakersfield to Sylmar via the I-5/Grapevine has a low potential to impact archaeological sites, while the Antelope Valley alignment option has a high potential to impact archaeological sites, including recorded trash scatters from historic period along rail corridors.

For the HST Alternative, the alignment options from Bakersfield to Sylmar via the Grapevine have a medium to high potential for effects or impacts on historic properties/resources, whereas the Antelope Valley alignment option has a low to medium potential for such impacts. Both alignment options leading into the LAUS have a high potential to affect or impact historic properties/resources because of the historic area surrounding the station.

The HST alignment options with the lowest potential impact on paleontological resources would be the I-5/Grapevine south of Bakersfield, using the Union Avenue corridor, and the Metrolink/I-5 aerial alignment option into LAUS. The I-5/Grapevine south of Bakersfield, using the Wheeler Ridge alignment and or the SR-58 and SR-14 corridors through the Antelope Valley with an at-grade cut would have greater potential impacts on paleontological resources.

D. LOS ANGELES TO SAN DIEGO VIA INLAND EMPIRE

Modal Alternative

The Modal Alternative has the potential to affect 85 recorded sites in this region; 44 of these are in the March ARB to Mira Mesa corridor. From March ARB to Mira Mesa, all alignments and corridors are ranked as having high potential impacts. From Mira Mesa to San Diego, the Modal Alternative is ranked as having medium potential impacts.

There are many commercial and residential properties/resources that date to the periods between1900 to 1929 and 1930 to 1958 along the rail routes between Los Angeles and Ontario. There are relatively few historic properties/resources along the rest of the Modal Alternative alignment; only 16% of the study area developed during the historic period. The overall potential impact ranking concerning historic structures for this region is medium.

The mountainous terrain just south of Temecula is considered to contain important traditional tribal cultural areas. The Pechanga Band of Luiseno Indians has expressed particular concern that the project not effect traditional cultural properties in the vicinity of Temecula.

For peleontological resources within this region, the potential level of effects is high for the Modal Alternative.

High-Speed Train Alternative

The HST Alternative for this region receives a medium rank for potential effects to archaeological resources, having the potential to affect between 125 and 136 recorded archaeological sites, depending on the alignments used and excluding the spur from Mira Mesa to Qualcomm Stadium. For the corridor from LAUS to March ARB, there are between 18 and 25 recorded sites. For the corridor from March ARB to Mira Mesa, there are either 60 or 62 recorded sites, depending on which route through Escondido is used. From Mira Mesa to San Diego, there are 47 or 49 recorded sites, depending on which alignment between Mira Mesa and the Transit Center is used. There are five recorded sites in the corridor from Mira Mesa to Qualcomm Stadium.

The average historically developed area along the HST alignments between LAUS and March ARB is 27.5%, with the highest being the UPRR Colton Line via San Bernardino (33%), and the lowest the UPRR Riverside Line–UPRR Colton Line (21%). The average historically developed area along the HST alignments between March ARB and Mira Mesa is 0.3% due to the rural characteristics of this area. For Mira Mesa to San Diego, the two alignments each average about 21% of the study area built during the historic period. None of the spur from I-15 to Qualcomm Stadium developed during the historic period. Over 95% of the area around the San Diego Station at the Santa Fe Depot was developed during the historic period, and the station structure is listed in the NRHP. The overall potential impact to historic structures for this region is considered medium-ranked.

The mountainous terrain just south of Temecula is considered to contain important traditional tribal cultural areas. The Pechanga Band of Luiseno Indians has expressed particular concern that the project not affect traditional cultural properties in the vicinity of Temecula.

While both the Modal and HST Alternatives potential impacts on historic structures is calculated as medium, the HST alignment is nearly twice the length as the Modal Alternative.

For paleontological resources in this region, the HST Alternative, like the Modal Alternative, would have similar potential impacts on Pliocene-Pleistocene nonmarine sedimentary rock units and Quatenary Dune Sand.

High-Speed Train Alignment Options Comparison

The segment between March ARB and Mira Mesa has the highest potential to impact archaeological resources. The segment from LAUS to El Monte passes directly adjacent to San Gabriel Mission, where there are recorded archaeological sites dating to the late eitheenth and nineteenth centuries and high potential for encountering additional buried archaeological material from the historic period. The two HST alignment options (I-15 to Coast via Miramar Road and I-15 to Coast via Carroll Canyon) are ranked as having high potential impacts.

For this region, the UPRR Colton Line via San Bernardino would have the highest potential to impact historic properties.

E. LOS ANGELES TO SAN DIEGO VIA ORANGE COUNTY

Modal Alternative

The Modal Alternative would have potential impacts on 108 recorded archaeological sites in this region, resulting in a medium sensitivity ranking. However, all of the recorded sites are south of Irvine Station. This is due to lack of archaeological surveys north of Irvine Station prior to development of the area; as mentioned above, there were few systematic archaeological surveys until the passage of CEQA in 1971. More than 70% of the portion of the Modal Alternative between LAUS and Irvine and between SR-52 and Santa Fe Depot developed during the historic period, prior to 1958.More than 70% of the portion of the Modal Alternative between LAUS and Irvine and between SR-52 and Santa Fe Depot developed during the historic period. This Alternative, therefore, has a high ranking for potential to effect or impact historic properties/resources and known historic properties/resources are located within the APE.

High-Speed Train Alternative

There are three recorded archaeological sites between LAUS and Anaheim (UPRR corridor) and 21 sites between LAUS and Irvine following the LOSSAN (BNSF) corridor. The spur from LAUS to LAX has seven recorded sites.

The HST alignment option from LAUS to Anaheim via the UPRR ranks low for recorded archaeological sites.

For the HST alignments, 52% of the area between LAUS and Anaheim (UPRR corridor) and 78% of the area between LAUS and Irvine following the LOSSAN (BNSF) corridor developed during the historic period. Fifty-eight percent of the area along the spur from LAUS to LAX developed historically. The HST Alternative between LAUS and Irvine has a high potential to result in effects and impacts on historic properties/resources because much of the area developed during the historic period and historic properties/resources remain along the corridor.

Over 95% of the area around the San Diego Station at the Santa Fe Depot was developed during the historic period, and the building is listed in the NRHP.

3.12.5 Design Practices

The Authority and FRA are committed to avoiding potential impacts to cultural resources through careful alignment design and selection. The Authority is committed to avoiding impacts to Native American resources to the extent feasible and practical.

The Authority will develop procedures for fieldwork, identification, evaluation, and determination of potential effects to cultural resources in consultation with SHP and Native American Tribes. On-site monitoring is often incorporated in the fieldwork when sites are known or suspected of containing native American human remains. The procedures need to comply with federal and state statutes concerning burials.

3.12.6 Mitigation Strategies and CEQA Significance Conclusions

Based on the analysis above, and considering the CEQA Appendix G thresholds of significance for cultural and historic resources, the proposed HST system alternative would have a potentially significant effect on cultural and historic resources when viewed on a systemwide basis. Although placing the conceptual corridors for the HST system alternative within or along existing transportation corridors reduces the potential for adverse effects to many resources, providing HST service to and locating potential stations sites in metropolitan centers increases the potential for adverse impacts to cultural and historic resources. Additional avoidance and mitigation strategies will be applied in the second-tier, project-level analyses. However, some cultural and historic resources will be adversely affected should a decision be made to proceed with the development of the HST system. At the programmatic level of analysis, it is not possible to know precisely the location, extent and particular characteristics of impacts to these resources. Because of this uncertainty, at the programmatic level of analysis the impact is considered significant. Mitigation strategies, as well as the design practices discussed in section 3.12.7, will be applied to reduce these impacts.

General mitigation strategies are discussed in this section as part of this programmatic evaluation. Should the HST Alternative be carried forward, the Authority and FRA would consult with SHPO to define and describe general procedures to be applied in the future for fieldwork, methods of analysis, and the development of specific mitigation measures to address effect and impacts on cultural resources, which could be reflected in a programmatic agreement between the Authority, FRA and SHPO. The Authority and FRA would also continue to consult with Native American tribes concerning the proposed undertaking, as required by federal and state laws concerning the management of historic properties (federal)/historical resources (state). Mitigation measures would be required for adverse effects (significant under CEQA) on cultural resources that are listed, determined eligible for, or that appear to be eligible for listing in the NRHP or CRHR. The mitigation measures ultimately selected for this undertaking will meet the Secretary of the Interior's *Standards and Guidelines for Archaeology and Historic Preservation* (48 FR 44716-44740), as well as standards and guidelines for historic preservation activities established by the California SHPO.

At the conclusion of the programmatic environmental review process, the Authority and the FRA, in consultation with the SHPO, would develop a programmatic memorandum of agreement (PA) to describe expectations for the next phase of fieldwork, eligibility determination, and documentation under Section 106 of NHPA and pursuant to CEQA. The PA may specify procedures for the identification and evaluation of impacts for future projects and the site-specific work that would be required during project-level environmental review.

These potential measures provide two levels of mitigation and are organized by resource type. One level of mitigation are those that, when implemented as conditions of project approval, would enable the project to avoid an adverse effect or impact. The other level of mitigation includes measures that would lessen the degree of adverse effect/impact. No one measure presented in this section would mitigate all adverse effects or impacts, however, some combination of these measures and others negotiated during the project phases of the program will emerge as the agreed upon mitigation for this project.

In general, there is a wide range of actions that can qualify as mitigation, depending on the type of project, the type of property, and impacts the project may have on cultural resources. The following list presents some of the principles that generally guide mitigation development in historic preservation practice.[9]

- Mitigation measures should correspond or be related directly with the resource being affected, rather than in a compensatory fashion that does not relate to the affected resource;
- Mitigation should be consistent with the significance of the historic property and correspond to the severity of project effects on the historic property;
- Mitigation must be relevant to the goals of historic preservation, rather than as an enhancement of the project to which it is related or as enhancement to amenities unrelated to the affected properties;
- Mitigation measures that are chosen should be a worthwhile use of public funds and provide a high degree of public benefit relative to the cost;
- Mitigation measures should benefit the greatest number of people, particularly those members of the interested public rather than only those of a specialized audience or particular group;
- Historic properties that will be demolished or greatly altered should be documented in permanent forms.

A. ARCHAEOLOGICAL RESOURCES

The following are potential mitigation measures for eligible or listed archaeological sites:

- Consider avoidance of impact, and when avoidance cannot be accommodated, consider minimizing the scale of impact..
- Incorporate the site into parks or open space (P.R.C. § 21083.2).
- Cap or cover the site before construction.
- Provide data recovery.
- Develop procedures for fieldwork, identification, evaluation, and determination of potential effects to cultural resources in consultation with SHPO and Native American tribes. On-site monitoring is often incorporated in the fieldwork when sites are known or suspected of containing Native American human remains. The procedures need to comply with federal and state statutes concerning burials.

[9] These factors are based on those presented in: Caltrans, "San Francisco-Oakland Bay Bridge East Span Seismic Safety Project, Consideration of Proposed Mitigation Measures," September 1999.

Avoidance is preferred, but if adjustments to the alignment plan or profile are not feasible, data recovery may be provided. When impacts will destroy or affect the data potential of a property (NRHP Criterion D/CRHR Criterion 4), data recovery may consist of archaeological excavation of an adequate sample of site contents so that the research questions applicable to the site can be addressed. Recovery of important information from the site mitigates the information loss that would result from site destruction. If only part of a site were impacted by the project, data recovery would only be necessary for that portion of the site. Data recovery would not be required if the agency determines prior testing and studies had adequately recovered the scientifically consequential information from the resources (CEQA Guidelines, 14 C.C.R. § 15126.4[b]).

When other NRHP or CRHR criteria are relevant (e.g., Criterion A/1; Criterion B/2; Criterion C/3) or when a Traditional Cultural Property is involved, it is often necessary to consider more diverse mitigation measures.

B. HISTORIC PROPERTIES/RESOURCES

Measures to avoid adverse effects would include steps taken in both the design and construction phases of the project. Avoidance has occurred and would occur during the design phase by not including components that could possibly effect or impact historic properties/resources. Avoidance would also occur by conducting construction activities to actively evade historic properties/resources.

The following are potential mitigation measures for historic properties/resources Measures to avoid Adverse Effects:

Stabilization/Monitoring During Construction. The lead agency would prepare a treatment plan that would present a detailed methodology for the protection of historic properties/resources, such as buildings, structures, objects, and sites, and cultural landscape elements that are in close proximity to construction activities. This treatment plan would describe methods for the preservation, stabilization, shoring / underpinning, and monitoring of buildings, structures, and objects. The treatment plan would also include provisions that high vibration construction techniques would be avoided in sensitive areas. Underpinning and/or other stabilization methods could be used at buildings located near project construction areas and that may be susceptible to damage or inadvertent destruction.

Measures to Lessen Adverse Effects. Measures to minimize project impacts to historic properties/resources would occur in pre-construction, construction, and post-construction phases. Many of these mitigation measures would require careful agency review and may require stipulations in the contracts of the construction contractors to ensure appropriate preservation of cultural resources.

Recordation. The lead agency would ensure that cultural resources adversely affected by the project would be recorded and documented to the standards of the Historic American Building Survey (HABS) or Historic American Engineering Record (HAER). This would require coordination with the NPS HABS / HAER program to determine the appropriate level of recordation. This coordination would also address the adequacy of recordation previously conducted for historic properties/resources that may be adversely affected.

Design Guidelines. The lead agency would ensure that design guidelines would be developed to ensure sympathetic, compatible, and appropriate designs for new construction. Aesthetic details can be considered mitigation, but there may be a limit to the amount of change possible in the design once important engineering and environmental considerations have been taken into account. It is most likely that the design guidelines mitigation would apply to the visual appearance of the project, rather than specifics of alignment, overall depth / width, or placement of supports. Design guidelines could be informed by the documentation prepared under HABS/HAER standards. It would be necessary for an architectural historian or a historical architect to advise the structural designers on appropriate architectural treatments that could serve as mitigation. SHPO and other agencies would review draft design guidelines and provide comment on the guidelines as well as on proposed design changes.

Interpretive / Educational Materials and Popular Report. The lead agency could prepare interpretive and/or educational materials and programs regarding the affected historic properties/resources. The focus of this mitigation would be the historic themes related to these resources. Such materials and/or programs could include: a popular report; documentary videos, booklets, interpretive signage, additional interpretive information made available to state and local agencies. These materials could also include salvage items, historic drawings, interpretive drawings, current and historic photographs, models, and oral histories. Assistance could also be provided for archiving or digitizing the documentation of cultural resources affected, as well as for the dissemination of the material to appropriate repositories.

Relocation. Historic properties/resources that would be otherwise demolished because of the project could be relocated and rehabilitated. The lead agency would ensure that these buildings or structures were recorded to HABS standards prior to their removal and in consultation with NPS. The lead agency / project proponent would prepare a removal plan, including site plans for the new locations and placing them on new foundations and to conditions consistent with those that existed prior to the move.

Monitoring (Architectural / Cultural Landscape). The project construction documents and new construction would be monitored to ensure they conform to the design guidelines and any other treatment procedures agreed to by the consulting parties. A professional architectural historian and a professional historical landscape architect, who meet the Secretary of the Interior's *Professional Qualifications Standards* (48 FR 44738-9), would monitor construction to identify conditions that could conflict with the mitigation measures. The lead agency would take steps to correct these conflicts.

Minor Repairs and Reconstruction. The lead agency would ensure that inadvertent damage to historic properties/resources would be repaired in accordance with the Secretary of the Interior's *Standards for Treatment of Historic Properties*.

Salvage. The lead agency would ensure that selected decorative or architectural elements of the adversely affect historic properties/resources would be reviewed for feasibility of salvage in order to mitigate their loss or destruction. Where possible, these elements would be retained and incorporated into the new construction. Where re-use was not possible, selected salvaged elements could be made available for use in interpretive displays either near the affected resources or at an appropriate museum, for example.

C. PALEONTOLOGICAL RESOURCES

Mitigation measures for paleontological resources would be developed and implemented at the project level. The following measures may be included.

- Educate workers.
- Recover fossils identified during the field reconnaissance.
- Monitor construction.
- Develop protocols for handling fossils discovered during construction, likely including temporary diversion of construction equipment so that the fossils could be recovered; identified; and

prepared for dating, interpreting, and preserving at an established, permanent, accredited research facility.

The above mitigation strategies, including implementation of a programmatic agreement addressing historic resources and continued consultation and coordination with tribal representatives, are expected to substantially lessen or avoid impacts to cultural and historic resources in most circumstances. At the second-tier, project-level review it is expected that for proposed HST alignments which would result in impacts to cultural and historic resources, most of the impacts will be mitigated to a less-than-significant level, but it is possible that for some impacts will be significant. Sufficient information is not available at the program level to conclude with certainty that the above mitigation strategies will reduce impacts to affected resources to a less than significant effect in all circumstances. Therefore, potential impacts to cultural and historic resources are considered significant at the program level even with the application of mitigation strategies. Additional environmental assessment will allow more precise evaluation in the second-tier, project-level environmental analyses.

3.12.7 Subsequent Analysis

The following paragraphs describe the procedures that would be necessary at the next stage of environmental review (a Tier-2 study) to determine appropriate and feasible mitigation measures in consultation with the SHPO, if a decision is ultimately made to go forward with the proposed HST system. These procedures would satisfy the NHPA and also satisfy CEQA requirements.

As allowed under 36 C.F.R. § 800.4(b)(2), a phased approach to identification of historic properties can be used when the proposed undertaking involves corridors. As indicated by the results of this study, FRA and the Authority have determined that historic properties likely exist in various corridor segments, through background research, consultation, and abbreviated field reconnaissance. Once alternatives have been refined, full identification efforts may proceed. Under NHPA Section 106 and implementing regulations (36 C.F.R. § 800), the procedures would include identifying resources with the potential to be affected; evaluating their significance under NRHP and CEQA; and identifying any substantial adverse effects, and then evaluating potential mitigation.

In the interest of identifying archaeological sites within the APE, a field survey of the APE should be completed which will identify those sites evident on the surface, geomorphological maps and studies should be reviewed to assess the potential for corridor segments to contain significant buried sites, and historic maps and an historic overview or context should be developed in the interest of identifying potential historical archaeology sites within the APE.

Additional efforts must also be made to consult with appropriate Tribes and individuals knowledgeable about the nature and locations of potential traditional cultural properties.

Identifying potentially affected archaeological and historical properties/resources would require identification and evaluation within a more specifically defined APE that would include the area where direct and indirect impacts from construction could occur (including locations of easements and construction-related facilities, such as equipment staging areas, borrow and disposal areas, access roads, and utilities) and the area(s) where the settings of any eligible historic buildings and structures, or the buildings and structures themselves, could be materially or significantly altered.

All identified resources would then be evaluated using NRHP and CRHR eligibility criteria. Evaluating archaeological sites may require preparing test plans for archaeological resources that contain regionally relevant research questions. The Authority and the FRA would consult with the SHPO on any test plans and determinations of eligibility for evaluated resources. The impacts of a proposed specific project on resources determined eligible would be analyzed. An impact analysis report may then be reviewed with the SHPO. Mitigation measures needed to address impacts on specific resources could then be developed and incorporated in an MOA between the SHPO, the Advisory Council on Historic Preservation, the FRA, and the Authority during the preparation of project-specific environmental evaluation. The mitigation measures in the MOA would then be incorporated into project-specific environmental documentation and project approvals.

A paleontological resource assessment program would also be completed as part of the subsequent analysis for a project-level EIR/EIS. The assessment program would include field reconnaissance to identify exposed paleontological resources and more precisely determine potential paleontologic sensitivity for the project. A paleontological resources treatment plan would be prepared by a qualified paleontologist. The plan would be included in project approval and would address the treatment of paleontological resources discovered prior to and during construction.

Further consultation would also occur at the project level with the Native American Heritage Commission as necessary, and with Native American groups when traditional territories may be close to APEs for the project. Additionally, more specific information related to traditional cultural sites of concern would be obtained as necessary.

3.13 GEOLOGY AND SOILS

This section describes existing geologic conditions in the five study regions and analyzes the potential geological impacts of each alternative and proposed HST alignment option. This analysis focused on potential impacts related to seismic hazards; landslide hazards; locations of oil and gas fields, geothermal fields, and mineral resource sites, and on bedrock and other conditions that could affect excavation.

3.13.1 Regulatory Requirements and Methods of Evaluation

A. REGULATORY REQUIREMENTS

A number of state regulations apply to geologic hazards and engineering geologic practice. The following paragraphs summarize key regulatory provisions; more detailed discussion is deferred to project-level environmental documentation because these regulations, if applicable, relate to site-specific conditions and thus would be applied as appropriate at the project level rather than the program level.

Principal state guidance relating to geologic hazards is contained in the Alquist-Priolo Act (P.R.C. § 2621 *et seq.*), and in the Seismic Hazards Mapping Act of 1990 (P.R.C. § 2690–2699.6). The Alquist-Priolo Act prohibits the location of most types of structures for human occupancy across the active traces of faults in earthquake fault zones shown on maps prepared by the state geologist, and regulates construction in the corridors along active faults (earthquake fault zones). The Seismic Hazards Mapping Act of 1990 focuses on hazards related to strong ground shaking, liquefaction, and seismically induced landslides. Under its provisions, the state is charged with identifying and mapping areas at risk of strong ground shaking, liquefaction, landslides, and other corollary hazards, and the maps are to be used by cities and counties in preparing their general plans and adopting land use policies in order to reduce and mitigate potential hazards to public health and safety.

Site-specific geotechnical investigations may be prepared to provide a geologic basis for the development of appropriate construction design for proposed projects, including mitigation/ remediation of geologic hazards where this is possible. Geotechnical investigations typically assess the bedrock and Quaternary geology, the geologic structure, the soils, and the previous history of excavation and fill placement on and in the vicinity of the site for a proposed project. They may also address the requirements of the Alquist-Priolo Act and the Seismic Hazards Mapping Act.

Pursuant to the Surface Mining and Reclamation Act (P.R.C. § 2710 *et seq.*), the State Mining and Geology Board identifies in adopted regulations areas of regional significance that are known to contain mineral deposits judged to be important in meeting the future needs of the area. (See P.R.C. § 2726 and 2790; Title 14 C.C.R. 3550, *et seq.*) The State Mining and Geology Board also adopts state policy for the reclamation of mined lands and certifies local ordinances for the approval of reclamation plans as being consistent with state policies (P.R.C. § 2755–2764, 2774 *et seq.*).

B. METHOD OF EVALUATION OF IMPACTS

To evaluate potential impacts related to geology and soils, each alternative was ranked for potential seismic hazards (ground shaking and ground failure potential), surface rupture hazard (number of active fault crossings), slope instability, areas of difficult excavation, presence of oil/gas/geothermal fields (presence of the resource and/or production facilities), and presence of economic mineral resources. The analysis was performed generally on the basis of existing data available in geographic information systems (GIS) format as opposed to detailed site investigations. The geologic data provided in this section are intended for planning purposes and are not intended to be definitive for specific sites. Alignments were evaluated by the regional team technical leads as having high, medium, or low potential for geologic impacts based on the number of geologic constraints identified.

Airports, stations, and other facilities were evaluated as having high or low potential for geologic impacts, based on the number of geologic constraints identified. These rankings made it possible to provide a rough comparison of the potential geologic constraints affecting each alternative and each alignment.

The following paragraphs describe the ranking process. Table 3.13-1 summarizes the ranking criteria for potential geologic and soils impacts.

Table 3.13-1
Ranking System for Comparing Impacts Related to Geology/Soils/Seismicity

Impact Ranking	Seismic Hazards (% of Length)	Active Fault Crossings (Number of Crossings)	Slope Instability (% of Length)	Difficult Excavation (% of Length)	Oil and Gas Fields (% of Length)	Mineral Resources (Present or Not Present)
Alignments						
High	>50	2+	>10	>25	>20	>20
Medium	10–50	1	5–10	10–25	10–20	10–20
Low	<10	0	<5	<10	<10	<10
Airports/Stations/Facilities						
High	Present	Present	Present	Present	Present	Present
Low	Not Present	Not Present	Not Present	Not Present	Not Present	Not Present

Seismic Hazards

Seismic hazards that could potentially constrain the design of proposed facilities were evaluated on the basis of potential for strong ground motion and potential for liquefaction. Areas potentially subject to strong ground motion were defined for this program-level study as areas where peak horizontal ground accelerations in an earthquake may exceed 0.50g (i.e., areas where peak horizontal ground acceleration may exceed 50% of the acceleration due to gravity) as mapped by the California Geological Survey (formerly the California Division of Mines and Geology) (State of California 1999). This acceleration is used to calculate the horizontal force a structure may be subjected to during and earthquake. For this analysis, liquefaction was conservatively assumed to be possible in all areas where peak ground accelerations could exceed 0.30g, except for areas mapped as underlain by bedrock. Where groundwater levels were not known from existing literature, they were conservatively assumed to be high, contributing to increased potential for liquefaction.

The ranking system for impacts related to seismic hazards used the percentage of each potential alignment within strong ground motion zones and/or potentially liquefiable zones. Station and airport sites were compared by determining whether any portion of the proposed station site would be within a strong ground motion zone or potentially liquefiable zone.

- Alignments: High, medium, or low, based on percentage of alignment length in strong ground motion zones plus the percentage of length in potentially liquefiable zones.
- Stations/airports: High if any part of the site is within a strong ground motion zone or potentially liquefiable zone; otherwise, low.

Potential for Surface Rupture (Active Fault Crossings)

Surface rupture hazard was evaluated based on whether any portion of a project alignment or facility would be located within 200 ft (62 m) of the mapped trace of any fault with known or inferred movement during Quaternary time (the past 1.6 million years). If any portion of a proposed alignment or potential facilities site was within 200 ft (62 m) of a Quaternary fault, it was identified as crossing an active fault trace. As described below, the State of California defines active faults as those that show evidence for movement in the last 11,000 years. Because of the extreme disruption of transit facilities that can result from surface fault rupture, this analysis deliberately adopted a conservative criterion for the assessment of surface rupture hazard and included potentially active faults, those with known or inferred movement over Quaternary time.

The ranking system for impacts related to surface rupture hazard was based on the number of active fault crossings identified.

- Alignments: High, medium, or low, based on number of active (recent or Quaternary) fault crossings.
- Stations/airports: High if any part of the site is within 200 ft (60 m) of an active (recent or Quaternary) fault; otherwise, low.

Slope Instability

Slope stability was evaluated based on the geologic formations or units present along each alignment and at each facilities site, as shown in statewide mapping compiled by Jennings (1977, 1991). Each of the mapped geologic units was assigned a rating for inferred slope stability, based primarily on lithology (physical characteristics of the rock formation) and age. This approach allowed the identification of areas at risk for slope instability. A conservative 200-ft (60-m) buffer was included around each identified area of instability.

The ranking system for impacts related to slope instability was based on the percentage of each alignment within potentially unstable zones. Station and airport sites were compared by determining whether any portion of the site is within an area of potential slope instability.

- Alignments: High, medium, or low, based on percentage of alignment length in potentially unstable zone.
- Stations/airports: High if any part of the site is within a potentially unstable zone; otherwise, low.

Difficult Excavation

Areas of potentially difficult excavation were identified based on bedrock geologic characteristics in combination with the presence of faults of any age, based on statewide mapping compiled by Jennings (1977, 1991) and information from selected 1:250,000-scale geologic map sheets for the study regions published by the California Geological Survey. Each fault crossing was conservatively assumed to be approximately 600 ft (185 m) wide. Geologic cross-sections were prepared to assess subsurface tunneling conditions along proposed HST tunnel segments.

The ranking system for impacts related to difficulty of excavation was based on the percentage of each alignment where excavation would be required within identified areas of difficult excavation. Stations and airport sites were compared by determining whether any portion of the site is within an identified area of difficult excavation.

- Alignments: High, medium, or low, based on percentage of surface segments in hard rock plus percentage of tunnel segments within fault zones.
- Stations/airports: High if any part of the site is within a hard rock zone or fault zone; otherwise, low.

Oil, Gas, and Geothermal Fields

Areas where the presence of oil, gas, and geothermal resources could constrain project construction or operation were identified on the basis of published resource maps produced by the California Department of Conservation's Division of Oil, Gas, and Geothermal Resources (California Department of Conservation 2001a, 2001b).

The ranking system for impacts related to oil, gas, and geothermal fields was based on the percentage of each proposed alignment within identified oil and gas or geothermal field areas. Station and airport sites were compared by determining whether any portion of the proposed site is within a mapped oil, gas, or geothermal field areas.

- Alignment: High, medium, or low, based on percentage of alignment length within mapped oil and gas plus geothermal fields.
- Stations/airports: High if any part of the site is within a mapped oil, gas, or geothermal field; otherwise, low.

Mineral Resources

Areas where the project could affect mineral resource extraction (primarily sand and gravel deposits) were identified on the basis of reports and published maps by the United States Geologic Survey, and California Geologic Survey.

The ranking system for mineral resources impacts was based on the number of mineral resources sites intersected by each alignment. Station and airport sites were compared by determining whether any portion of the site is within a mineral resource area. The potential value of mineral resources varies with time with demand for the resource. Thus, evaluation of specific sites for relative importance was not considered for this program-level study.

- Alignments: High, medium, or low, based on number of mapped resources within 200 ft (60 m) of a mineral resource area.
- Stations/airports: High if any part of the site is within 200 ft (60 m) of a mineral resource area; otherwise, low.

3.13.2 Affected Environment

A. STUDY AREA DEFINED

The study area for geology and soils is defined as the corridor extending 200 ft (60 m) on each side of the alignment centerlines, and a 200-ft (60-m) radius around each station or airport site. This distance incorporates all cross-sections with the exception of deep cuts and fills. As described in *Method of Evaluation of Impacts* above, alternatives were compared based on the number of sites with potential geologic or soils impacts per alternative, which depends on the length and location of the alignment; broadening the study area to include the entire width of deep cut-and-fill sections would not change the results of the comparison.

B. GENERAL DISCUSSION OF GEOLOGY AND SOILS

The following sections describe key project constraints related to geology and soils.

Seismic Hazards

Seismic hazards are generally classified in two categories: *primary seismic hazards* (surface fault rupture and ground shaking) and *secondary seismic hazards* (liquefaction and other types of seismically induced ground failure, along with seismically induced landslides).

Primary: *Surface fault rupture*, or ground rupture, occurs when an active fault ruptures at depth to produce an earthquake, and the rupture propagates to the ground surface. Surface rupture can also occur as a result of slow, gradual motion referred to as *fault creep*. An area's potential for ground rupture is assessed based on the displacement history of the area's faults. Two categories of faults have been defined by the State of California in Special Publication 42 (Hart and Bryant 1997). *Active faults* are those that are known or inferred to have experienced movement in the past 11,000 years and are considered to have a high potential for future ground rupture. *Potentially active*[1] faults are those that are not known to have experienced movement in the past 11,000 years but have moved during Quaternary time (the past 1.6 million years). These faults may also pose a surface rupture hazard, but the hazard is more difficult to evaluate. For the purpose of this study, both active and potentially active faults were evaluated, and considered active faults in subsequent sections.

Ground shaking occurs in response to the release of energy during an earthquake. The energy released travels through subsurface rock, sediment, and soil materials as seismic waves, which result in motion experienced at the ground surface.

Secondary: *Liquefaction* and other types of seismically induced ground failure reflect loss of strength and/or cohesion when earth materials are subjected to strong seismic ground shaking. Earthquakes can also trigger landslides where slopes are prone to failure because of geologic conditions or because of modifications during construction.

Surface fault rupture, ground shaking, and seismically induced ground failure all can result in substantial damage to structures. Thorough assessment of the existing hazard combined with appropriate design and construction can reduce the potential for damage substantially.

Unstable Slopes

Slopes are considered unstable (prone to failure or landslides) when soil or rock strength is insufficient to resist gravitational forces or other loads. Slope instability can occur naturally due to factors such as fracture patterns, soil saturation, or steep slopes. Slope failure can also be triggered by seismic activity or by improperly designed construction.

If slope instability is not adequately characterized and mitigated during design and construction, it can cause severe damage to surface and near-surface improvements as well as risks to public safety. However, slope instability can generally be addressed with planning and design.

Areas of Difficult Excavation

Subsurface geologic conditions will largely determine the ease or difficulty of excavation, which will in turn indicate the appropriate excavation technique for use in various areas. For instance, hard unfractured bedrock may be difficult to excavate using bulldozers and other earthmoving equipment, or too resistant to tunneling using a tunnel boring machine; in these areas, blasting may be required. On the other hand, fractured rock that contains groundwater can also be difficult to excavate using tunneling methods. Faulted material can pose an additional challenge by contributing to instability at the tunnel face.

Geological Resources

Geological resources in California include oil and gas fields, geothermal fields, and a wide range of mineral resources. The principal constraint associated with oil, gas, geothermal, and mineral resources is the need for planning to ensure that construction of new facilities would not conflict with the removal of economically important resources and would avoid known problem areas to

[1] The term "potentially active" is under review for alternative nomenclature by California Geologic Survey.

the extent feasible. In addition, the presence of even small (noneconomic) quantities of oil or gas in the subsurface can pose toxic or explosive hazards during construction, requiring specific precautions, and may also necessitate special designs and monitoring during the operation of subsurface structures such as subway tunnels. Similarly, certain mineral resources, such as serpentine (the source of natural asbestos) can result in hazardous working conditions if not properly managed.

C. GEOLOGY AND GEOMORPHOLOGY BY REGION

Appendix 3.13-A contains tables summarizing the geologic constraints in each of the five study regions. The following paragraphs provide an overview of key geomorphologic features in each region, based on Norris and Webb's (1990) overview of California's geomorphic provinces and information from topographic maps published by the U.S. Geological Survey.

Bay Area to Merced

This region includes central California from the San Francisco Bay Area (San Francisco and Oakland) south to the Santa Clara Valley and east across the Diablo Range to the Central Valley. The Bay Area to Merced region spans two of California's geomorphic provinces: the Coast Ranges province and the Great Valley province.

The Coast Ranges uplift consists of generally northwest-trending ridges that form a rugged barrier between the Pacific Coast and inland California. The valley occupied by San Francisco Bay, bordered by the Diablo Range and East Bay Hills on the east and the Santa Cruz Mountains on the west, is one of several fault-bounded valleys within the Coast Ranges; other important regions of low elevation near the study area include the Salinas, Napa, and Sonoma Valleys.

The Great Valley province comprises a large, elongated north-trending valley situated between the Coast Ranges on the west and the Sierra Nevada on the east. Much of the Great Valley is at elevations near sea level (Norris and Webb 1990). The valley is structurally controlled, with faults occurring at the boundaries between valley and mountain range.

Sacramento to Bakersfield

This region of central California includes a large portion of the Central Valley (San Joaquin Valley) from Sacramento south to Bakersfield. Relatively uniform, gentle terrain that typifies the interior of California's Great Valley geomorphic province characterizes this region. As described above, the Great Valley province consists of an elongate north-trending valley bordered by the Sierra Nevada and the Coast Ranges (Norris and Webb 1990).

Bakersfield to Los Angeles

This region of southern California encompasses the southern portion of the Central Valley south of Bakersfield, the mountainous areas between the Central Valley and the Los Angeles basin, and the northern portion of the Los Angeles basin from Sylmar to downtown Los Angeles. The Bakersfield to Los Angeles region includes portions of three major geomorphic provinces: Great Valley, Mojave, and Transverse Ranges. Consequently, terrain in this region is highly variable. From the southern end of the San Joaquin Valley, the proposed alignments would climb several thousand feet to cross the rugged Tehachapi Mountains. They would descend across the westernmost portion of the Mojave province, and would climb again to cross the San Gabriel Mountains before descending into the Los Angeles basin. The Los Angeles basin is a fault-bounded depression within the Transverse Ranges province, which was named for its westerly structural and geomorphic grain, transverse to the dominant northerly-northwesterly fabric of California landscapes (Norris and Webb 1990).

Los Angeles to San Diego via Inland Empire

This region of southern California includes the eastern portion of the Los Angeles basin (Transverse Ranges) from downtown Los Angeles east to the Riverside and San Bernardino areas and south to San Diego generally along the I-215 and I-15 corridors. This region is located in the Los Angeles basin and the Peninsular Ranges province. The Los Angeles basin is bounded by several westerly-trending ranges, including the Elysian, Repetto, Puente, and San Joaquin Hills and the Santa Ana Mountains. The Peninsular Ranges province is characterized by a series of northwest- to west-northwest-trending fault-bounded mountain ranges.

Los Angeles to San Diego via Orange County

This region includes the western portion of the Los Angeles basin between downtown Los Angeles and Los Angeles International Airport (LAX) and the coastal areas of southern California between Los Angeles and San Diego, generally following the existing Los Angeles to San Diego via Orange County I-5 highway corridor. The route follows a coastal corridor that traverses parts of two geomorphic provinces: the Transverse Ranges and Peninsular Ranges. Key features of this southern region include spectacular coastal cliffs.

3.13.3 Environmental Consequences

A. EXISTING CONDITIONS COMPARED TO NO PROJECT ALTERNATIVE

Existing conditions describes transportation conditions as of 2003. The No Project Alternative includes existing transportation infrastructure plus all planned, approved, and funded projects that can reasonably be expected to be in operation by 2020. This analysis assumed that existing major infrastructure (bridges, for example) was designed, has been retrofitted, or is currently scheduled to be retrofitted to meet current design standards for seismic safety and other geologic constraints, and that future projects included in the No Project Alternative would incorporate similar safeguards as part of the development, design, and construction process. However, it is not possible to eliminate or mitigate all geologic hazards through design and construction. Some types of geologic hazards (seismic hazards in particular) are also unpredictable. While it is difficult to evaluate the change in hazards (potential for geologic impacts) between existing conditions and No Project conditions, it can be assumed that some improvements in technology and materials as well as more stringent design codes will be implemented in the next 20 years to address seismic design of new structures. Thus the No Project Alternative would be somewhat improved from the existing conditions, but existing geologic risks were assumed to be representative of geologic risks under the No Project Alternative.

B. NO PROJECT ALTERNATIVE COMPARED TO MODAL AND HIGH-SPEED TRAIN ALTERNATIVES

This analysis focused on comparing the difference in impacts anticipated with the proposed Modal and HST Alternatives, using 2020 No Project conditions as a baseline.

As shown in Table 3.13-2, geologic constraints would be similar for the proposed Modal and HST Alternatives. They include the following.

- Active fault crossings.
- Potential for strong seismic ground shaking.
- Unstable slopes.
- Difficult excavation of tunnels and deep cuts.
- At-grade construction over problem soils.

Active seismicity represents a key constraint on design and construction for both the Modal and HST Alternatives. Portions of both the Modal and HST Alternatives would require special design, including additional structural ductility and redundancy to withstand severe ground shaking as well as the potential for liquefaction and/or other types of seismically induced ground failure. Conceptual alignments have been laid out so that the proposed HST Alternative would cross major faults at grade; nonetheless, active fault crossings would require special designs to minimize potential damage to the rail lines and other infrastructure as a result of surface fault rupture and surface disruption associated with fault creep. Modal Alternative designs would be subject to similar requirements.

Construction of mountain crossings for both the Modal and HST Alternatives would be constrained by existing unstable slopes and areas of difficult excavation. The tunnels proposed under the HST Alternative would pose additional design and construction issues because of difficult excavation conditions. The Modal Alternative would not require tunnel construction, so impacts related to difficulty of excavation would be less under the Modal Alternative. In the LOSSAN segment, however, tunnel construction under the HST would result in lower impacts on coastal geology because impacts on the stability of coastal bluffs would be reduced.

Potential geologic impacts that are categorized as high should not be regarded as precluding construction of an alternative or an alignment option, or as necessarily indicating that these would be potentially significant impacts. Rather, they identify aspects of project design where additional study would be needed and where engineering and design effort would be required to avoid or mitigate the impacts.

Table 3.13-2
Summary of Geology Potential Impact Rankings by Alternative and Segment

		Bay Area to Merced		Sacramento to Bakersfield		Bakersfield to Los Angeles		Los Angeles to San Diego (via Inland Empire)		Los Angeles to San Diego (via Orange County)	
Category	**Impact**	**Modal**	**HST**	**Modal**	**HST**	**Modal**	**HST**	**Modal**	**HST**	**Modal**	**HST**
Seismic hazards	Potential risk to worker and public safety due to collapse or toppling of partially constructed or completed facilities during strong earthquakes. Potential risk to public safety due to automobile accidents/interruption of service due to derailment caused by ground motion during strong earthquakes. Damage to facilities due to secondary hazards over soft or filled ground.	H	M	L	L	H	H	H	H	H	H
Active fault crossings	Potential risk to worker or public safety due to ground rupture along active faults. Potential risk to public safety due to damage to highway or airport/interruption of service due to derailment by ground rupture along active faults.	M–H	H	H	L	H	M–H	H	H	M	M
Slope stability	Potential risk to worker or public safety due to failure of natural and/or construction cut slopes or retention structures.	L–H	L–M	L	L	L	L	L	L	L	M
Difficult excavation	Potential cost and duration of surface or tunnel excavations during construction.	L–M	M	L	L	L	M	H	M–H	L	L–M
Oil and gas fields	Potential migration of potentially explosive and/or toxic gases into subsurface facilities.	L	L	L	L	L	M	L	M	L	L
Mineral resources	Potential project costs and delays due to potential impacts on existing mineral resource areas and facilities, including potential remediation.	L–M	L–M	L	M	L	L	H	M	L	L

H = High impact.
M = Medium impact.
L = Low impact.

3.13.4 Comparison of Alternatives by Region

A. BAY AREA TO MERCED

Modal Alternative

In the Bay Area to Merced region, the majority of the Modal Alternative alignments are located in areas of potentially strong ground shaking and, to a lesser extent, areas potentially subject to liquefaction and/or other types of seismically induced ground failure. Active fault crossings would be a concern along I-80 from I-880 to I-5, along I-580 from I-880 to I-5, and along SR-152 from US-101 to I-5. Overall, the Modal Alternative ranked high with respect to seismic hazards, with the exception of the segment along SR-152 from SR-99 to I-5.

Slope stability would be a major consideration where the alignment would require widening of existing highway cuts along SR-152 through the Diablo Ranges. However, the potential for slope stability impacts is low along the remainder of the Bay Area to Merced modal alignments.

Areas where hard rock may be difficult to excavate occur in mountain crossings along SR-15, I-80, and I-580.

High-Speed Train Alternative

In the Bay Area to Merced region, the majority of the HST alignments are located in areas of potentially strong ground motion, and to a lesser extent, areas potentially subject to liquefaction and/or other types of seismically induced ground failure (Figure 3.13-1). Active fault crossings would also be a concern along I-580 from I-880 to I-5 and along SR-152 from US-101 to I-5. Overall, the HST Alternative ranked medium in this region with respect to seismic hazards.

All of the proposed HST alignment alternatives that cross the Diablo Range traverse steep and potentially unstable slopes where the proposed alignment would be at grade or in cuts into slopes. There would be little to no concern about slope stability where the alignments cross the nearly flat topography of the San Francisco Bay margin, the Santa Clara Valley, and the Central Valley. In addition, considering the lengths of the alignments, the potential for slope stability impacts is low through the Diablo Range.

High-Speed Train Alignment Options Comparison

The most likely areas of difficult underground excavation would be the Diablo Range crossings where rocks of the Franciscan Complex are highly variable and include some rock units that are typically hard and fracture zones are common. The proposed tunnel options are all through Franciscan rock.

B. SACRAMENTO TO BAKERSFIELD

Modal Alternative

In the Sacramento to Bakersfield region, the Modal Alternative alignments are ranked medium and high for seismic hazards. Along the western edge of the Central Valley, portions of the I-5 alignment between I-5/I-580 near Tracy in the north and Kettleman City in the south (Stockton to Modesto, Modesto to Merced, and Merced to Fresno corridors) are subject to strong ground shaking (0.7g), as they are along the west side of the Central Valley, near the coastal ranges and in closer proximity to active faults than the HST alternative.

High-Speed Train Alternative

Seismic hazards, including ground motion, liquefaction, and other seismically induced ground movement, are considered relatively minor for the HST Alternative alignments in the Central Valley. All of the alignments are located in regions ranked low for seismic ground shaking, with the exception of the southern end of the corridor (Bakersfield area), where predicted ground motion is slightly higher but is not expected to exceed 0.5g.

High-Speed Train Alignment Options Comparison

Oil and gas fields would potentially affect all of the following proposed HST alignment segments, as they would the Stockton Downtown Station, Bakersfield Airport Station, and Bakersfield Golden State Station sites. Because the length of the alignment through the oil and gas fields would be relatively short, the overall rankings were all low for impacts due to oil and gas.

Mineral resources provide a potential means to distinguish proposed alignments in parts of the Central Valley. The following alignments and sites ranked high for potential impacts related to mineral resources: Sacramento Downtown Valley station site, Sacramento Power Inn Road station site, and all Sacramento to Stockton alignment options. The presence of mineral resources (typically sand and gravel deposits) is most significant in the Sacramento area but would potentially impact all HST alignment options in the Sacramento to Stockton corridor to some extent.

C. BAKERSFIELD TO LOS ANGELES

Modal Alternative

In the Bakersfield to Los Angeles region, the Modal Alternative is considered to have high potential for impacts related to seismic hazards and fault crossings. With the exception of I-5 from Burbank to Los Angeles Union Station (LAUS), all Modal Alignment segments cross at least one Quaternary fault. Approximately seven active faults, including the Garlock and San Andreas, cross the segment of I-5 that extends between SR-99 and SR-14. The segment of SR-14 between Palmdale and I-5 has approximately five fault active crossings, including the San Andreas.

High-Speed Train Alternative

The HST Alternative alignment options in the Bakersfield to Los Angeles region are considered to have high potential for impacts related to seismic hazards (Figure 3.13-2). In addition, tunneling proposed with the HST Alternative would result in higher design, construction, and operational costs than at-grade construction. Six faults intersect the I-5 Tehachapi corridor, which extends from Wheeler Ridge to San Fernando, and seven faults cross the Soledad Canyon corridor. In addition, the I-5 Tehachapi alignment option would run parallel to an active fault (San Gabriel Fault) for over 20 miles. With regard to active fault crossings, the HST Alternative is ranked low to medium.

High-Speed Train Alignment Options Comparison

All proposed HST alignments through the Tehachapi Mountains would encounter at least four major fault crossings. The most significant crossings would include the San Andreas and the Garlock faults, which are capable of generating large earthquakes (over magnitude 7). The alignment would be designed to cross these faults at grade. The I-5 alignment options would have considerably higher seismic hazards and constructability issues than the Antelope Valley option since it would run parallel to the San Gabriel fault Los Angeles to San Diego via Inland Empire

D. LOS ANGELES TO SAN DIEGO VIA INLAND EMPIRE

Modal Alternative

The Modal Alternative is considered to have high potential for impacts related to relatively frequent earthquake activity and the presence of the following faults: the San Jose fault at I-10 in Pomona, the southern San Bernardino fault at I-10 in San Bernardino, and the Temecula fault at I-15 in Temecula. Difficult excavation for cut slopes in hard rock formations would also be a concern in this region.

High-Speed Train Alternative

Several active faults are located in the immediate vicinity of the proposed HST segments and the HST stations; consequently, this alternative ranked high for seismic hazards. The significant faults include the Elysian Park, Rialto-Colton-Claremont, San Jacinto, Murrieta Hot Springs, Whittier-Elsinore, and Newport-Inglewood-Rose Canyon faults. In addition, three active faults cross the proposed HST segments in this region, including the southern San Bernardino, the Temecula, and, in San Diego, the La Jolla. This alternative would also encounter areas of difficult excavation in tunneled sections due to fractured rock.

High-Speed Train Alignment Options Comparison

There is not a significant difference among the proposed HST Alternative alignment options in this region based on geology.

E. LOS ANGELES TO SAN DIEGO VIA ORANGE COUNTY

Modal Alternative

In the LOSSAN region, the Modal Alternative ranked high for impacts related to seismic hazards between LAUS and Irvine, San Juan Capistrano and Camp Pendleton, and SR-52 and Santa Fe Depot in San Diego.[2] Overall, about half of the Modal Alternative would traverse areas of high seismic hazard. Additionally, the Modal alignment crosses three active faults in the southern portion of the region.

High-Speed Train Alternative

In the LOSSAN region, the HST Alternative ranked high for potential impacts related to seismic hazards along the route between LAX and LAUS. It also crosses two active faults in this area. The HST Alternative also ranked high for potential impacts related to seismic hazards between LAUS and Irvine) and proposed station sites except the Irvine station site.

3.13.5 Design Practices

The Authority has specifically avoided or minimized potential effects related to major geologic hazards such as major fault crossings, oil fields, and landslide areas throughout extensive alignment studies completed prior to and as part of the program EIR/EIS process. The Authority's objective is to avoid fault crossings in tunnel or aerial sections, and this has been carried through the development of the alternatives. Any impacts that remain at the conclusion of project level environmental review would be mitigated through specific design and construction practices described in the following mitigation section.

3.13.6 CEQA Significance Conclusions and Mitigation Strategies

Based on the analysis above, and considering the CEQA Appendix G thresholds of significance for geology and soils, the HST alternative would have potentially significant impacts when viewed on a system-wide basis. In some alignment segments there would be potential for increased soil disturbance due to slope instability. The HST alternative would involve some seismic hazards along alignment segments being susceptible to ground motion. The proposed HST system would reduce exposure to seismic risk by crossing any known active faults at grade. Mitigation strategies, as well as the design practices discussed in section 3.13.5, will be applied to reduce these impacts.

This document contains a broad program analysis that generally identifies the locations of potential geologic impact areas for the proposed alternatives. These are areas that would need further study in environmental documentation at the project level.

[2] No Modal Alternative improvement is proposed between LAX and LAUS.

Mitigation for potential impacts related to geologic and soils conditions must be developed on a site-specific basis, based on the results of more detailed (design-level) engineering geologic and geotechnical studies. Consequently, geologic and geotechnical mitigation would be identified in subsequent, project-level analysis rather than at the program level. Following is an overview of general approaches to possible geologic and geotechnical mitigation.

A. GROUND SHAKING

The potential for traffic safety issues related to ground shaking during a large earthquake cannot be mitigated completely; this holds true for most vehicle transportation systems throughout California. However, some strategies are available to reduce hazards, including the following.

- The potential for collapse or toppling of superstructures such as bridges or retaining structures due to strong ground motion can be routinely mitigated by designing structures to withstand the estimated anticipated ground motions. Designs typically include additional redundancy and ductility in the structure. The design needed to withstand a certain magnitude of earthquake would be determined during subsequent stages of design and development of proposed facilities. Temporary facilities, such as shoring, would be designed considering a lower probability of seismic events.
- The potential for structural damage and resulting traffic hazard as a result of liquefaction can be mitigated through site-specific methods such as ground modification methods (soil densification) to prevent liquefaction, or structural design (e.g., deep foundations) to accommodate/resist the liquefiable zones.
- It is unlikely that the potential for HST derailment during a peak event could be mitigated by designing a track-wheel system capable of withstanding the potential ground motions in most of the project area. Existing train systems throughout California face the same challenge. However, a network of strong motion instruments has been installed throughout California and additional monitoring stations are proposed. These stations provide ground motion data that could be used with the HST instrumentation and controls system to temporarily shut down the HST operations during or after an earthquake. The system would then be inspected for damage due to ground motion and/or ground deformation and then returned to service when appropriate. This type of seismic protection is already used for many rapid transit systems in seismically active areas and has been proven effective.

B. FAULT CROSSINGS

The potential for ground rupture along active faults is one of the few geologic hazards that can rarely be fully mitigated. However, known active faults are typically monitored, and in some cases fault creep is mitigated with routine maintenance, which could include repaving or minor track re-alignment. Project design could provide for the installation of early warning systems triggered by strong ground motion associated with ground rupture. Linear monitoring systems such as time domain reflectometers (TDRs) could be installed along major highways and rail lines within the zone of potential ground rupture. These devices emit electronic information that is processed in a centralized location and could be used to temporarily control traffic and trains, thus reducing accidents. In addition, the HST Alternative has been modified in mountain crossing areas where tunnels are proposed to avoid crossing known or mapped active faults within the tunnel.

C. SLOPE STABILITY/LANDSLIDES

The potential for failure of natural and/or temporary construction slopes and retention structures can be mitigated through geotechnical investigation and review of proposed earthwork and foundation excavation plans and profiles. Based on investigation and review, recommendations would be provided for temporary and permanent slope reinforcement and protection, as needed. These recommendations would be incorporated into the construction plans. Additionally, during construction, geotechnical inspections would be performed to verify that no new, unanticipated conditions are encountered, and to verify the proper incorporation of recommendations. Slope monitoring may also be incorporated in final design where warranted.

D. AREAS OF DIFFICULT EXCAVATION

The potential for difficult excavation in areas of hard rock and faults cannot be fully mitigated, but it can be anticipated so that safety is assured, potential environmental impacts are addressed, and project schedule problems are avoided to the extent possible. This includes focusing future geotechnical engineering and geologic investigations in these areas and incorporating the findings into project construction documents, communicating with the contractors during the bid process, and monitoring actual conditions during and after construction.

E. HAZARDS RELATED TO OIL AND GAS FIELDS

Hazards related to potential migration of hazardous gases due to the presence of oil fields, gas fields, or other subsurface sources can be mitigated by following strict federal and state Occupational Safety & Health Administration (OSHA/CalOSHA) regulatory requirements for excavations, and consulting with other agencies as appropriate, such as the Department of Conservation (Division of Oil and Gas) and the Department of Toxic and Substances Control regarding known areas of concern. Mitigation measures would include using safe and explosion-proof equipment during construction and testing for gases regularly. Active monitoring systems and alarms would be required in underground construction areas and facilities where subsurface gases are present. Gas barrier systems have also been used effectively for subways in the Los Angeles area. Installing gas detection systems can monitor the effectiveness of these systems.

F. MINERAL RESOURCES

In some cases, mineral resources sites may represent valuable sources of materials that should either be completely developed prior to use for another purpose or should be avoided by proposed facilities to the extent feasible. This practice could result in realignment of proposed alignments and/or proposed relocation or modification of other proposed facilities. To mitigate the potential for significant project redesign, important mineral sites should be identified as early as possible.

Mitigation strategies to address seismic hazards such as liquefaction, seismically induced settlement and landslides as well as long-term settlement along oil fields may include, but would not be limited to:

- Design and engineer all structures for earthquake activity - Seismic design for the structures would be based on the Caltrans Seismic Design Criteria
- Design and install foundations resistant to soil liquefaction and settlement.
- Identify potential serpentinite bedrock disturbance areas and implement a safety plan
- Apply the requirements of Section 19 (Earthwork) of the most current Caltrans Standard Specifications to ensure geotechnically stable slopes are planned and created.
- Subsurface gases: Install passive or active gas venting systems and gas collection systems in areas where subsurface gases are identified.
- Remove corrosive soil and use corrosion protected materials in infrastructure.
- Address erosive soils through soil removal and replacement, geosynthetics, vegetation, and/or rip rap, where warranted.

- Remove or moisture condition shrink-swell soils, where necessary.
- Utilize stone columns, grouting, and deep dynamic compaction in areas of potential liquefaction
- Utilize buttress berms, flattened slopes, drains, and/or tie-backs in areas of slope instability.
- Avoid settlement through preloading, use of stone columns, deep dynamic compaction, grouting, and/or special foundation designs.

The above mitigation strategies are expected to reduce the geologic and soils impacts of the HST alternative to a less-than-significant level. Additional environmental assessment will allow a more precise evaluation in the second-tier, project-level of environmental analyses.

3.13.7 Subsequent Analysis

As described in *Method of Evaluation of Impacts* above, this analysis was performed generally on the basis of existing data available in GIS format. The data provided in this section are intended for planning purposes, are not meant to be definitive for specific sites, and have not been independently confirmed. More detailed geological studies would be required at the project level, and would likely include subsurface exploration, laboratory testing, and engineering analyses to support detailed alignment design and mitigation of potential impacts associated with geologic and soils conditions, including seismic hazards.